

**The Development of a Performance Measurement Framework for
FE/HE Co-Location Construction Projects**

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Abstract

Project success is understood differently by project participants because it is multifaceted, requiring many performance measures to determine success. Previous studies have underrepresented the business context of projects and their role in contributing to the success of the instigating organisation. This issue becomes particularly significant when two or more further and higher education (FE/HE) organisations co-locate their educational operations on a shared site and seek diverse goals from a single project. The relationship between construction project success and long-term educational success created the need for a comprehensive performance measurement framework that defines the contribution of the construction project in supporting FE/HE collaborating institutions through providing a learning environment that enhances the shared educational activities.

This study explores the success of constructing a co-located further and higher education (FE/HE) campus when a project definition that continues beyond construction project completion and commissioning, and which encompasses the client's views of expected business benefits, is adopted. The research developed a measurement framework capable of measuring the performance of FE/HE co-location construction projects, in light of this broader definition.

The methodology used to achieve the research aim, influenced by the pragmatic views of the researcher, combined several methods. A focus group identified success criteria for constructing FE/HE co-location campuses. A questionnaire survey elicited the relationships between success criteria from representatives of the directors, senior administrators, and estates managers of further and higher education providers throughout Scotland. Finally, a Delphi survey validated the performance measurement framework by capturing the views of experts in FE/HE co-location.

The thesis contributes a comprehensive performance measurement framework structured around two distinctive performance perspectives (performance drivers and performance results) which incorporates multiple project success dimensions and measures. The framework provides a structured way of aggregating performance measures to characterise the representation of thematic performance dimensions.

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Table of Contents

CHAPTER 1: INTRODUCTION	2
1.1 Rationale	2
1.2 Further and Higher Education (FE/HE) Collaboration.....	2
1.3 FE/HE Co-location.....	3
1.4 Scottish Borders Campus	4
1.5 Research Focus	6
1.6 Research Aim and Objectives	8
1.7 Research Design and Methodology.....	9
1.8 Contribution	12
1.9 Thesis Structure	13
CHAPTER 2: PERFORMANCE MEASUREMENT	17
2. 1 Introduction.....	17
2.2 Definitions	18
2.3 Approaches to Performance Measurement	19
2.4 Performance Measurement Frameworks	23
2.4.1 Du Pont Pyramid of Financial Ratios (1910).....	24
2.4.2 Performance Measurement Matrix (1989)	24
2.4.3 Performance Pyramid (1991)	25
2.4.4 Results and Determinants Model (1991)	28
2.4.5 The Balanced Scorecard (1992).....	29
2.4.6 The European Foundation for Quality Management Excellence Model (1992).....	31
2.4.7 Macro Process Model (1996).....	33
2.4.8 The Performance Prism (2001)	34
2.5 Performance Measurement Characteristics	36
2.8 Conclusion.....	38
CHAPTER 3: PROJECT SUCCESS	41
3.2 Project Definition	41
3.3 Characteristics of Construction Projects.....	43
3.4 Project Success	44

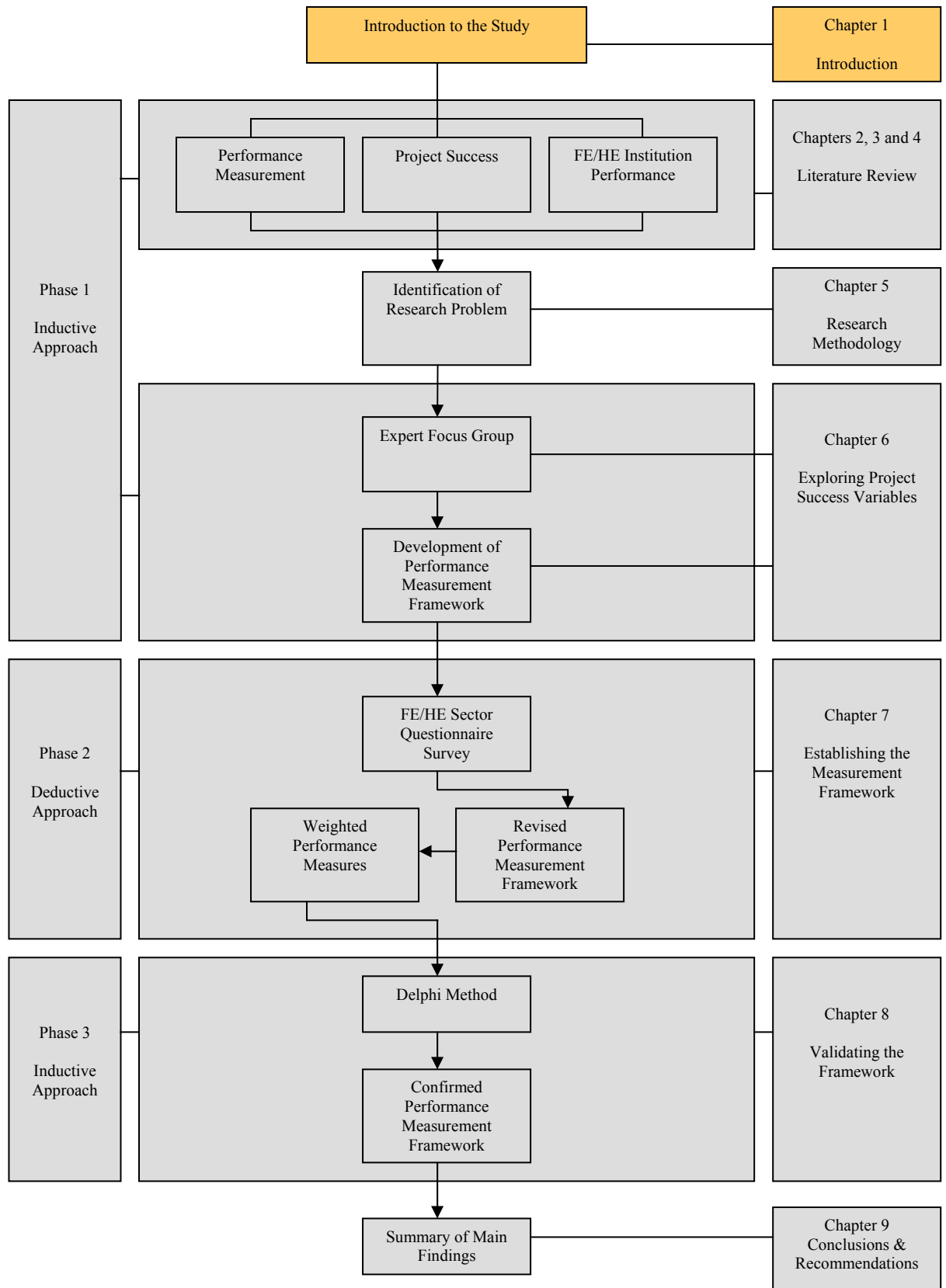
3.5 Success Factors	50
3.5 Project Success and its Measurement in Construction.....	52
3.6 Performance Measurement Frameworks in Construction	55
3.6.1 Key Performance Indicators.....	57
3.6.2 Conceptual Performance Measurement Process Framework (PMPF).....	59
3.6.3 An Integrated Business Improvement System (IBIS).....	60
3.6.4 A business performance measurement framework in construction	62
3.6.5 The Project Excellence Model	64
3.7 Conclusion.....	65
 CHAPTER 4: FURTHER AND HIGHER EDUCATION INSTITUTION PERFORMANCE	 68
4.1 Introduction.....	68
4.2 The structure of non-compulsory education	68
4.2.1 Nature of further education	69
4.2.2 Nature of higher education.....	70
4.5 Links between further and higher education	70
4.6 Quality of education institutions.....	71
4.7 Challenges of FE/HE.....	73
4.8 Co-location	75
4.9 Performance Measurement of Education Institutions	75
4.10 Framework Development	83
4.11 Conclusion.....	88
 CHAPTER 5: RESEARCH METHODOLOGY	 90
5.1 Introduction	90
5.2 Rationale	90
5.3 Research Problems.....	92
5.4 Research Aim and Objectives	93
5.5 Research Philosophies and Approaches.....	94
5.6 Research Paradigms	95
5.6.1 Ontological Orientation.....	96
5.6.2 Epistemological Orientation.....	98

5.7 Research Methodology.....	100
5.7.1 Inductive Research.....	102
5.7.2 Deductive Research.....	102
5.8 Research Methods	103
5.8.1 Qualitative Methods	103
5.8.2 Quantitative Methods	104
5.8.3 Focus Group Workshop	104
5.8.4 Questionnaire Survey	108
5.8.5 Delphi Survey	109
5.9 Conclusion.....	112
 CHAPTER 6: EXPLORING PROJECT SUCCESS VARIABLES.....	 114
6.1 Introduction.....	114
6.2 Using the Focus Group Method.....	114
6.2.1 Purpose.....	115
6.2.2 Sample Selection.....	116
6.2.3 Workshop Process.....	117
6.2.4 Focus Group Analysis and Results	120
6.3 Conclusion.....	130
 CHAPTER 7 ESTABLISHING THE MEASUREMENT FRAMEWORK.....	 132
7.1 Introduction	132
7.2 Questionnaire Sample.....	133
7.3 Questionnaire Design	133
7.3.1 Objectives of the Questionnaire	134
7.3.2 Choosing Suitable Questions	134
7.3.3 Piloting and Revising the Questionnaire.....	135
7.3.4 Administering the Questionnaire	137
7.4 Questionnaire Results	138
7.4.1 Data Analysis	138
7.4.2 Steps Involved in Exploratory Factor Analysis of Performance Drivers Measures	139
7.4.2.1 Assessment of the Suitability of the Data of Performance Drivers Measures	140
7.4.2.2 Factor Extraction.....	141
7.4.2.2.1 Kaiser-Guttman Rule	142
7.4.2.2.2 Scree Test.....	143
7.4.2.3 Factor Rotation and Interpretation	144
7.4.2.4 Interpretation of Factors.....	146
7.4.2.4.1 Collaborative Building Development	149
7.4.2.4.2 Collaborative Institutional Management.....	149
7.4.2.4.3 Sharing Educational Knowledge.....	149

7.4.2.4.4 Transition Administration	150
7.4.3 Steps Involved in Exploratory Factor Analysis of Performance Results Measures	150
7.4.3.1 Assessment of Suitability of Data of Performance Results Measures	151
7.4.3.2 Factor Extraction	152
7.4.3.2.1 Kaiser-Guttman Rule	152
7.4.3.2.2 Scree test	153
7.4.3.3 Factor rotation and interpretation	153
7.4.3.4 Interpretation of Factors	154
7.4.3.4.1 Learning Built Environment	156
7.4.3.4.2 Collaborative Educational Provision	156
7.4.3.4.3 Co-location Sustainability	156
7.4.4 The Measurement Framework	158
7.4.4.1 Performance Drivers Perspectives	158
7.4.4.2 Performance Results	158
7.4.5 Methods of Measurement	158
7.4.6 Performance Aggregation	160
7.4.6.1 Approaches to aggregation	161
7.4.6.2 Weighting Methods	163
7.4.6.3 Aggregation Methods	163
7.4.5.3.1 The Simple Additive Weighting (SAW) Method	164
7.4.5.3.2 The Weighted Product (WP) Method	165
7.4.5.4 Aggregating Performance Drivers Measures	165
7.4.5.5 Aggregating the Performance Drivers Dimensions	168
7.4.5.6 Aggregating Performance Results Measures	169
7.4.5.7 Aggregating the Performance Results Dimensions	170
7.4.5.8 Aggregating the Two Performance Perspectives	171
7.5 Conclusion.....	176
CHAPTER 8: VALIDATING THE FRAMEWORK.....	178
8.1 Introduction	178
8.2 The Delphi Method	178
8.3 Delphi Method Design and Application	179
8.3.1 Problem Definition.....	179
8.3.2 Panel Selection and Size	180
8.4 Conducting the Delphi Sessions	181
8.5 Delphi Results	183
8.5.1 First Session	183
8.5.2 Second Session.....	191
8.5.3 Third Session.....	195
8.5.4 Fourth Session.....	197
8.5.5 Fifth Session.....	201
8.6 The Validating Questionnaire.....	204
8.6.1 Questionnaire Sample	204

8.6.2 Framework Structure Rating	205
8.6.3 Performance Measures Rating	205
8.6.4 Measurement Methods Rating	206
8.6.5 Weightings of Performance Perspectives.....	207
8.6.6 Weightings of Performance Dimensions	208
8.5 Conclusion.....	213
CHAPTER 9 CONCLUSIONS AND RECOMMENDATIONS	215
9.1 Introduction	215
9.2 Revisiting the Research Aim	215
9.3 Revisiting the Research Objectives.....	219
9.3.1 Objective 1	219
9.3.2 Objective 2	220
9.3.3 Objective 3	221
9.3.4 Objective 4	222
9.3.5 Objective 5	223
9.3.6 Objective 6	224
9.4 Contributions to Knowledge	224
9.5 Benefits for the FE/HE Sector.....	225
9.6 Limitations	226
9.6 Recommendations	227
References	229
APPENDIX A	255
APPENDIX B	261
APPENDIX C	266
APPENDIX D	268
APPENDIX E	269
APPENDIX F	274

Chapter 1: Introduction



Chapter 1: Introduction

1.1 Rationale

The effective management of public sector resources is a key element of the strategy of Scottish Executive for economical development and the modernisation and improvement of Scotland's public services (Scottish Executive, 2004). Collaboration and sharing services between organisations was part of the "Building a Better Scotland Efficient Government Plan" which identified opportunities for collaboration in two key areas (Scottish Executive, 2004):

- Support functions which organisations need to perform their core businesses; and
- Common operational processes and systems which enhance delivered services and are duplicated within a number of organisations.

Scottish Executive (2004) advocated that organisations that share services deliver services that are more efficient and customer oriented as this type of collaboration permits time and cost savings through effective management of support functions and common operational processes. This informs decision making within organisations and, consequently, improves the quality of services offered to the customers.

1.2 Further and Higher Education (FE/HE) Collaboration

In the education sector, the Further Education (FE) sector introduces students to tertiary education. Cross-organisation collaboration helps it to become more accessible, allowing students to progress to degree programmes in universities (Morgan-Klein, 2003a). Many FE institutions are becoming involved in providing higher education by partnering with Higher Education (HE) institutions. This model of providing a higher education level has improved the status of further education institutions (Gallacher, 2006). Progression of further education students into higher education reflects successful collaboration between FE and HE institutions. Progression often involves articulation arrangements which allow students to progress from a further education institution to a specified higher education institution (Alexander *et al.*, 1995). This pattern is typified by students progressing from HNC or HND courses in further education institutions into year two or year three respectively of degree programmes at

universities (Thomson, 2003). Other links can take the form of franchising arrangements which include delivering a university's courses through a further education institution and validated programmes in which an HE institution accredits programmes offered by an FE institution (Alexander *et al.*, 1995).

1.3 FE/HE Co-location

Co-location means placing two or more groups (or organisations) together to share one place. In the education sector, co-locating further and higher institutions refers to placing two or more institutions on a single campus. This could take the form of sharing buildings, or sharing facilities and services through collaboration between institutions.

According to Linden (2010), organisations use co-location to enhance information sharing and trust; to produce innovative schemes; and to improve service provision. One of the major benefits of the co-location model, apart from potential financial savings, can be inferred from Goodwin (2009). He noted that co-location creates spatial conditions that promote spontaneous interactions between people who occupy the same building. This mechanism is particularly important in the education sector because having two or more FE/HE institutions can be a significant catalyst for enhancing collaboration and academic activities. Moreover, this mechanism - a co-location atmosphere - could create a new culture based on the traditions, values and the way of doing work at each participating institutions.

In co-locating educational institutions, each institution will continue to have its own autonomy but some facilities and services such as learning resource centres, catering and social areas will be shared. In addition to the pre-existing educational provision, institutions will have the opportunity to offer shared curricula and students will have access to a wider range of courses in the same location. Moreover, students will benefit from facilities and services on a scale beyond the capacity of a single institution.

An example of this innovative approach is Crichton Campus which is the first multi-institutional campus in Scotland. Established in 1999, Crichton Campus hosts the University of West of Scotland (UWS), the University of Glasgow and Dumfries and Galloway College. The co-located educational institutions maintain their individual organisational structures and separately provide a wide range of further and higher

education courses. Another example is the Scottish Borders Campus that is located in Galashiels. This shared campus is home to the Borders College and Heriot-Watt University (HWU). What is distinctive about this project is that both institutions share the same infrastructure and provide a range of support services for students with the potential to provide collaborative education courses. On a national level, the University Quarter is considered the largest joint education project of its type in the UK. It is a regeneration project for education purpose located in Stoke-on-Trent. This project provides a shared campus for Staffordshire University, Stoke-on-Trent College of Further Education, and the City of Stoke-on-Trent Sixth Form College.

1.4 Scottish Borders Campus

As part of the “Sharing Services” initiative introduced by the Scottish Executive, Borders College and Heriot-Watt University undertook an organisational restructuring exercise and reviewed their activities at Galashiels in the Scottish Borders. As a result, both institutions identified their strategy in terms of the preferred model of collaboration and decided to work together in providing further and higher education. This model comprised of physically co-locating Borders College and the Borders Campus of Heriot-Watt University in one campus. The cost of the co-location project was around £32m. The new Scottish Borders Campus was created to counter critical economic challenges in the Borders region. In addition, the physical infrastructure of the two collaborated institutions needed significant renovation. However, the main objective of this proposed model was to provide an innovative, effective, efficient and sustainable scheme for post secondary education in the Scottish Borders region. This model recognised that each institution maintains its autonomy in an attempt to increase opportunities for complementary collaboration. Moreover, the new Scottish Borders Campus was expected to achieve a number of objectives such as:

- To deliver sustainable, comprehensive and coherent tertiary education;
- To integrate the support services of both institutions to provide quality service to staff and students;
- To provide sufficient information and communication technology infrastructure to meet staff and student needs and to enhance support services; and
- To increase cost effectiveness and improve financial stability of both institutions.

Managing this new institutional model required Borders College and Heriot-Watt University to establish joint strategy and management structures. These joint structures were steered by a Joint Strategy Committee which included senior representation from both institutions in addition to external stakeholders. Reporting to this Committee was a Project Co-ordination Group that oversaw the project work undertaken by five work streams formed to organise and co-ordinate different project activities. These five work streams involved in managing two construction projects that facilitated the co-location project (Netherdale Construction and Hawick Construction), branding and marketing the new institutional model (Marketing), preparing plans for academic collaboration (Academic Coherence) and ensuring cost-effectiveness and managing the transition process through considering legal, facilities management, information and communication technology, human resources and change management (Management Structure and Savings). The above mentioned work streams included team members who held key positions within their organisations (Table 1).

Borders College	Heriot-Watt University
Principal	
Head of Marketing and Business Development	Director of Marketing and Business Growth
Finance Manager	Director of Finance
Assistant Principal - Planning and Quality	Director of Planning
Property Service Manager;	Director of Estates Director of Campus Services;
Assistant Principal - Student Services Community and Open Learning Manager	Director of Learning, Teaching and Quality
Assistant Principal	Director of Human Resource

Table 1: Roles of Key People Involved in Managing the Borders College and Heriot-Watt University Co-location Project Workstreams

This project provided the context and data gathering opportunities to the study. It formed an illustrative case of a FE/HE co-location project that assisted in clarifying how these types of projects can be successful through investigating success criteria and

performance measures with the key co-location project management members who were accessible and who supported the study throughout its different phases.

1.5 Research Focus

Delivering high quality educational services by co-locating two or more institutions at the same campus is an innovative approach that improves the efficiency of providing services and facilities, while offering a better learning environment for students and academic staff. Co-location, while providing an effective, efficient and strategic solution for enhancing educational infrastructure in a particular location, also brings to the co-locating institutions significant financial, functional and structural advantages that could be difficult to achieve otherwise.

Co-location projects are usually facilitated by a construction project that builds a new campus or extends an existing one to accommodate new functions. It is for this reason that developing a framework to assess how successful the co-location project is performing will not only introduce effective techniques for measuring its performance, but will also assist further and higher education institutions in managing and adapting to the sharing of services and facilities. In addition, measuring the success of this type of project will enhance the ability of educational institutions to counter escalating running costs and, at the same time, meet the growing demands of students for better quality and value for money.

Performance measurement is a significant management tool that the further and higher education institutions can use to evaluate, control and develop their co-location processes and realise their aims and objectives. Rantanen (2007) recognises the role of performance measurement in providing organisations with information about how well their targets have been achieved and in helping them to validate their strategies. In addition, performance measurement enables organisations to identify areas that are vital for their success in the marketplace which need further improvement (Bredrup, 1994). Moreover, performance measures can be used for benchmarking purposes (Ghalayini and Noble, 1996) where the performance of organisations within one sector can be compared, analysed and evaluated (McCabe, 2001). The use of performance measurement can be summarised in one of these three classifications: checking the

organisation's position, communicating the organisation's position, confirming the organisation's priorities or compelling progress (Neely, 1998). Sousa *et al.* (2005) identified the main reason for undertaking such activity: driving performance in the direction of achieving organisational objectives.

Having established the need to measure the performance of co-location projects, the way in which the performance measures are defined and selected also needs to be established. The process of selecting appropriate performance measures is important because it encourages management teams to be clear and precise concerning the priorities of their performance and the relationship between them (Neely *et al.*, 2000). De Wit (1988) suggested that project performance can be measured using project success criteria. This implies that defining project success can be an initial step to measure its performance. Selecting performance measures appropriate to comparing that performance with the project's predetermined objectives will depend on this definition of project success.

The concept of project success has been extensively examined in the project management literature. Projects have been traditionally claimed successful if certain criteria are achieved such as executing the project on time, within budget and to specified quality. These criteria were first identified in the early work on this subject (Gaddis, 1959). Using these three success criteria provided useful information to the project organisation and were generally accepted by researchers in the project management field (Andersen *et al.*, 2006). The challenge that researchers and project management professionals faced was that on some occasions, projects were finished on time, within budget and to the required quality, but they were considered a failure (Pinto, 2007). On the other hand, there have been projects that suffered from delays and went over budget, but they were still considered a huge success (Shenhar *et al.*, 2007a).

Project success necessitates a broader and more comprehensive conceptualisation which considers the wider and longer term impact of the project (Andersen *et al.*, 2006). Therefore, defining project success requires an exploration of the term "project" within the project management context. Projects have been defined by many researchers and professional bodies. Although these definitions provided common characteristics of project few referred to the place of the project within the business of the initiating

organisation (Kelly, 2005). Hence, the definition provided by Kelly (2005, p12), who defined a project as an “*investment of resources for return*”, will be adopted in this study because it signifies the fact that a project is initiated to add value to the core business of the initiating organisation. This definition also implies that a project’s full potential can only be realised some time after its completion. This definition is applicable to projects in any sector including the construction industry (Kelly, 2005). Recognising that construction projects tend to follow certain defined activities and phases to deliver the required outcomes, they differ in type and scope according to the nature and objectives of the business that the initiating organisation is undertaking. Andersen *et al.* (2006) supported this view by speculating that organisations use projects as means for creating change in pursuit of organisational goals. Therefore, defining and evaluating project success is a strategic management concept in that it links project activities to the short and long term objectives of an organisation (Shenhar *et al.*, 2007a). This view was found to correlate with significant impact on customers, improved business results and better preparation for the future (Stefanovic and Shenhar, 2007). As a result, a broader understanding of project success that connects projects to short and long term organisational objectives will inevitably delay the ultimate judgement on the project performance in such a way that measuring some performance aspects would be only possible on months or years beyond the project execution and handover phase (Chan *et al.*, 2002).

Applying this project success concept to the further and higher education (FE/HE) co-location projects requires understanding the performance characteristics of FE/HE institutions and integrating them into the success criteria by which the construction project used to facilitate the FE/HE co-location project performance will be evaluated. This integration will provide a comprehensive view of the FE/HE co-location projects that pays particular attention to the definition of co-location success held by further and higher educational institutions.

1.6 Research Aim and Objectives

The issues raised above suggest that there is an opportunity to explore the performance of a FE/HE co-location project facilitated by a construction project and the way by

which such performance can be measured. Consequently, research is required to investigate this problem. The aim of this study is therefore:

- To develop a comprehensive performance measurement framework for FE/HE co-location projects to provide further and higher education institutions with a structured way of measuring the performance of co-location projects.

To achieve this aim, this research study has the following objectives:

1. To explore the performance measurement frameworks used to assess general business performance;
2. To identify what constitutes “successful” projects by investigating success criteria and dimensions;
3. To review and examine how performance is measured in the construction industry;
4. To explore the nature of the FE/HE educational provision challenges facing FE/HE institutions and ways to measure the performance of FE/HE institutions;
5. To propose methods to measure the quantitative and qualitative aspects of co-location project success; and
6. To suggest a practical way to aggregate a set of performance measures into a single indicator.

1.7 Research Design and Methodology

This research concerns the development of a performance measurement framework that covers objective and subjective measures. It combines issues of performance measurement, construction project success and further and higher educational institution performance. This study is required to develop a structured method of aggregating the many different performance measures required to provide a comprehensive view so that the client organisation, which initiates the construction project, can obtain summarised measures to be used at strategic and operational levels. The research flowchart showing the phases of the study, the sequence of activities and the chapters included in thesis are illustrated in Figure 1.1.

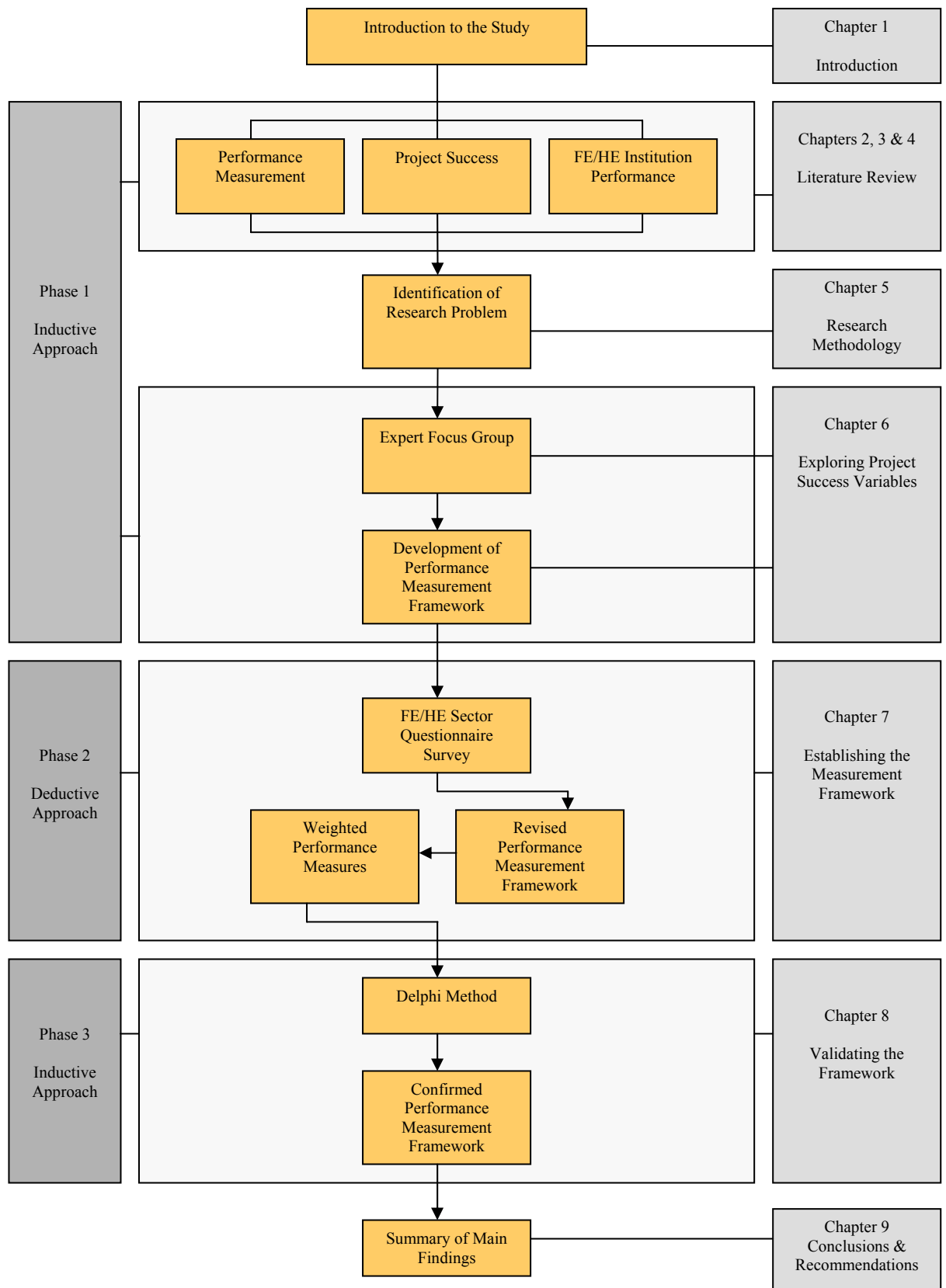


Figure 1.1: The Research Flowchart

The design of the research necessitates the selection of a philosophical framework within which the study will be positioned (Maxwell, 2005). This framework is referred to as a “paradigm”. The nature of this study, the research aim and the research objectives informed the selection of an appropriate paradigm in that a pragmatist view of the world was adopted. Within this paradigm, mixed epistemological orientations were adopted to construct what the researcher considered acceptable knowledge. They were an interpretivist approach within a positivist position.

Adopting certain paradigms has consequences on selecting the research methodology and research methods. The methodology of this study comprised three phases within which deductive and inductive approaches to research, quantitative and qualitative analysis methods and a number of data collection instruments and analysis techniques were utilised.

- **Phase 1**

This phase was exploratory in nature. It aimed to generate a comprehensive list of performance measures so that a conceptual performance measurement framework for FE/HE co-location projects involving the construction of a new campus or extending an existing one could be develop. Therefore, this phase followed an inductive approach which started by reviewing the literature of what is already known about general business performance measurement, project success concepts, and performance measurement of further and higher education institutions. The findings of the literature review were then used to structure a project performance measurement framework that focuses education sector. To narrow the remit of the framework and make it suitable for co-location projects delivering shared education experiences through building a co-located further and higher education campus, a focus group explored represented framework users’ opinion about performance measures used to assess the success of such projects.

- **Phase 2**

The aim of the second phase was to establish the structure of the measurement framework by identifying the performance dimensions of the FE/HE co-location

project and to suggest a suitable method to aggregate the different performance measures and performance dimensions into single indices. A deductive approach to research was followed. This approach involved administering a questionnaire survey to seek the opinions of the wider FE/HE sector about the performance measures developed at the exploratory phase. Findings from questionnaire analysis were used to establish the structure of the measurement framework. An aggregation method was developed to provide potential users with summarised performance information used to monitor FE/HE co-location project performance and assist in evaluating project success. The established framework, however, required further testing to examine its validity.

- **Phase 3**

The aim of this phase of the study was to validate and confirm the structure and content of the performance measurement framework in addition to the measurement method established in the second phase. In this phase, an inductive approach was followed in which the opinions of a panel of experts, who have experience in managing FE/HE a co-location project, were collected using the Delphi method. This method was used to reach consensus among the experts towards the measurement framework and the measurement method.

1.8 Contribution

The main contribution of the study is the development of a comprehensive performance measurement framework for FE/HE co-location projects facilitated by construction projects. This framework emphasises that FE/HE co-location project success expands beyond the completion of construction to include performance dimensions and measures that relate to the performance of the constructed campus, the performance of its inhabitants and the impact that the FE/HE co-location has on its local community.

The developed performance measurement tool provides governors and policy-driven people with the means to be acquainted with the performance dimensions of a co-located campus and criteria that determine the long-term success of sharing core and support educational services at one particular site. It was developed in a clear and feasible format for the use of educational institutions opting to share their facilities and

services with other institutions in one campus. They will have the opportunity to have a comprehensive view of key areas that need to be examined in detail when they manage their co-location projects. This tool also provides process-driven people who will manage the co-location project with a dynamic tool necessary to direct and control the project performance, and offers continuous improvement to the project processes.

1.9 Thesis Structure

The structure of this thesis comprises nine chapters. These chapters are:

- Chapter 1: Introduction
This chapter describes the background of this subject, presents the research focus, and defines the research aim and objective. It then provides an overview of the research design, approaches and methodologies that will be followed to address the research problems. At the end, the structure of this thesis is presented.
- Chapter 2: Performance Measurement
The concept of performance measurement and the ways by which organisational performance can be measured are reviewed in this chapter. The aim is to highlight what determines successful business performance and to explore the general characteristics of measurement frameworks, performance measures and the measurement process. Findings will be used as criteria for the validating the main findings of the study.
- Chapter 3: Project Success
This chapter reviews project definitions and project success as they were presented in the project and construction management literature. This chapter also investigates project success criteria and dimensions for general projects and those developed to measure the performance of construction projects. A comprehensive measurement framework for project success in construction is then suggested. This framework will be used in later stage of the study in developing a comprehensive measurement framework for FE/HE co-location projects.

- **Chapter 4: Further and Higher Education Performance**
This chapter explores the nature of further and higher education and the challenges FE/HE institutions have which have impacts on the performance of FE/HE institutions. It also reviews how these institutions measure their performance and identifies key performance areas that a measurement framework should include to help organisations achieve co-location project success.
- **Chapter 5: Research Methodology**
The theoretical positioning of the research that relates to the success of FE/HE co-location projects is presented in this chapter. It synthesises the findings of chapters two, three and four to present a valid research proposition. This chapter also establishes a research philosophical position, identifies research methodologies and appropriate methods to collect and analyse the data as required to fulfil the study objectives.
- **Chapter 6: Exploring Success Variables**
This chapter describes the logic of the conceptual framework development and clarifies the reasons for using the focus group technique as means for exploring success characteristics of FE/HE co-location construction projects. Moreover, it describes the process of conducting the workshop, illustrates and highlights the results of using this method. At the end, this chapter presents the findings of the first phase and concludes by providing a modified version of the measurement framework which needs further investigation.
- **Chapter 7: Establishing the Measurement Framework**
This chapter represents the second phase of the study. It uses the findings of the focus group for designing a survey questionnaire to capture the opinion of a wider sample of the further and higher education sector. The chapter also presents the results of the questionnaire and explains how they were used to establish the FE/HE performance measurement framework. It also proposes an aggregating method that combines different performance aspects at different levels into single indices providing a higher level performance dashboard for

senior management to oversee the overall performance of the co-location project.

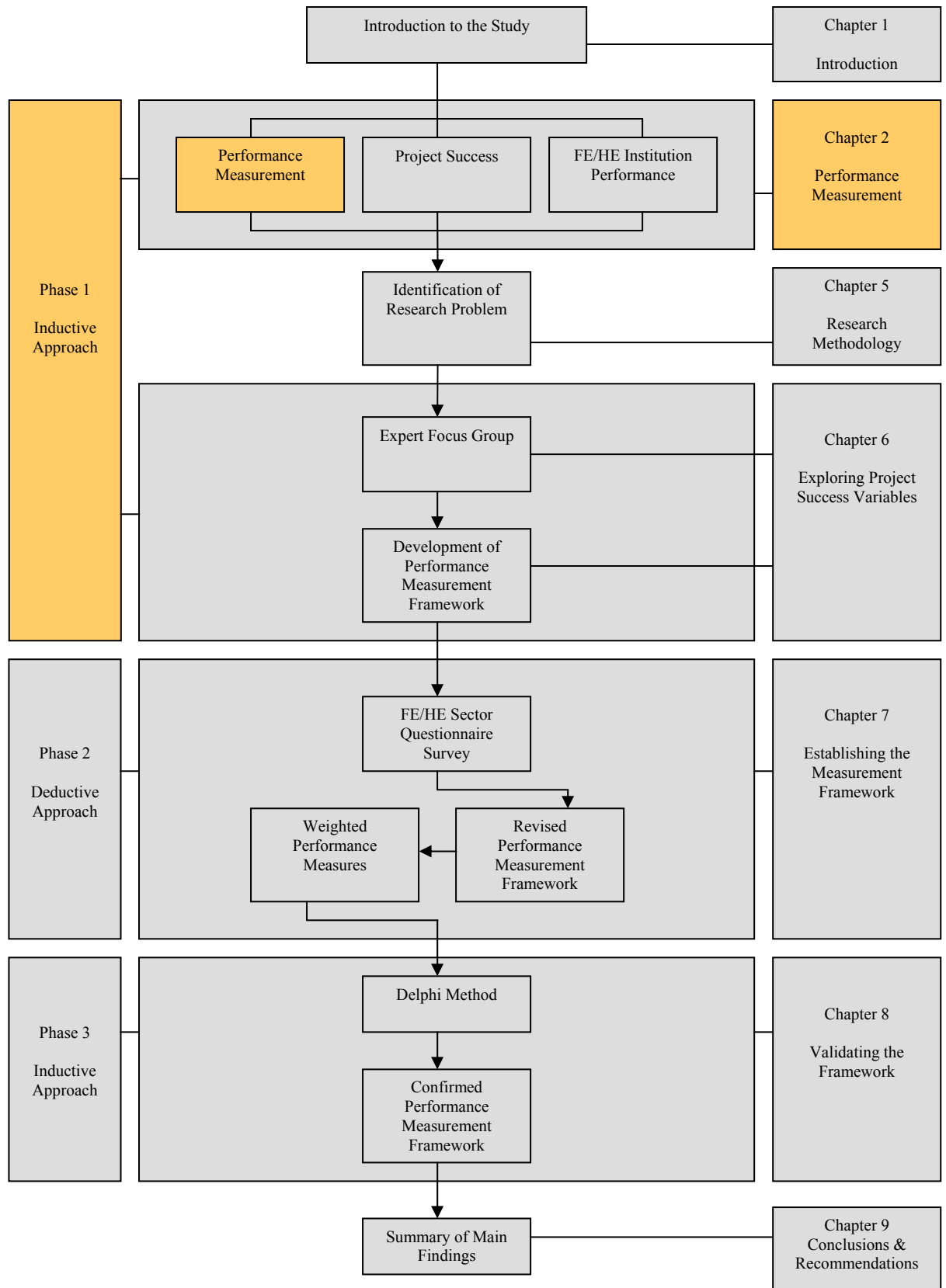
- Chapter 8: Validating the Measurement Framework

The validation process of the developed framework is presented in this chapter. In this chapter, embodying the third phase of the study, the Delphi method is used to perform the validation. This method is used to elicit the opinions of people who are considered experienced in the field of FE/HE co-location project and to confirm the suitability of framework structure, performance measures and the process of measurement.

- Chapter 9: Conclusions and Recommendations

This chapter summarises the thesis and presents the main findings of the study. It also presents suggestions and recommendations for future research sties in the subject. Limitations and reflections on the lessons learned throughout the research are highlighted.

Chapter 2: Performance Measurement



Chapter 2: Performance Measurement

2.1 Introduction

Performance measurement is a significant management tool that organisations use to compete in an ever changing environment. It supports decision-making processes by providing information about how well a set of targets have been met and how precisely predictions have been made (Rantanen *et al.*, 2007). Sink and Tuttle (1989) asserted that what cannot be measured cannot be managed. Therefore, one of the key tasks of organisations is to design and implement an effective measurement system that assist in providing sufficient and detailed information about their performance for internal and external purposes (Bredrup, 1994).

Organisations use performance measures to evaluate, control and develop their business processes to realise their aims and objectives (Ghalayini and Noble, 1996). Another reason for using performance measures is for benchmarking purposes (Ghalayini and Noble, 1996) where the performance of companies within one sector can be compared, or even the performance of different departments within one organisation are compared, analysed and evaluated (McCabe, 2001). According to Neely (1998) reasons for using performance measurement can be classified into one of the following categories: checking the company's position, communicating the company's position, confirming the company's priorities or compelling progress. Sousa *et al.* (2005) identified the main reason for undertaking this exercise, driving the performance in the direction of achieving organisational objectives. Performance measurement also helps in demonstrating transparency, promoting a productive environment and shaping accountability (de Bruijn, 2002).

This chapter reviews the concept of performance measurement and the ways by which organisational performance can be measured. There are two objectives of investigating this subject in this research. The first is to highlight what determines successful business performance through investigating the structure of performance measurement frameworks. The other objective is to explore the general characteristics of measurement frameworks, performance measures and the measurement process. The findings of this chapter will set foundation for the validation chapter that examines the appropriateness of the findings of this study.

2.2 Definitions

Several terms in the performance measurement literature need to be defined to establish a perspective of this review of the subject, viz:

- Performance is “*the efficiency, effectiveness and adaptability of a company*” (Bredrup, 1994, p173).
- Measurement is “*assigning a numerical scale to the size, value or other characteristic of a tangible or intangible object*” (Kaydos, 1998, p15).
- A performance measure is “*an indicator used to quantify the efficiency and/or effectiveness of purposeful actions*” (Neely et al., 2002, p12).
- Performance measurement is “*the process of determining how successful organisations or individuals have been in attaining their objectives*” (Sinclair and Zairi, 1995, p50).
- Performance measurement system (PMS) is “*a set of metrics used to quantify the efficiency and effectiveness of purposeful actions*” (Neely et al., 2002, p12).
- Performance measurement framework “*refers to the active employment of particular sets of recommendations. [It] assists in the process of performance measurement system building, by clarifying performance measurement boundaries, specifying performance measurement dimensions or views and may also provide initial intuitions into relationships among the performance measurement dimensions*” (Folan and Browne, 2005, p665).
- Performance measurement system (PMS) is “*a systematic way of evaluating the inputs, outputs, transformation and productivity in a manufacturing or non-manufacturing operation*” (Sinclair and Zairi, 1995, p50).

2.3 Approaches to Performance Measurement

The literature shows that the subject of performance measurement has been extensively researched. According to Ghalayini and Noble (1996), performance measurement has been developed through two main phases. The first phase started in the late 1880s and progressed through into the 1980s. Performance measures used in this phase were financial in nature. The second phase began in the late 1980s. In this phase, businesses used a balanced set of performance measures that includes financial and non-financial measures.

In the first phase, the focus was on financial measures such as return-on-investment (ROI), net-present-value (NPV), earnings per share and other management accounting measures. Financial results of organisations were considered of vital significance for measuring their performance (Maskell, 1991). This was because the growth of manufacturing industries, and consequently, the increase of industrial firms in the last two centuries created a need for provision of sufficient monetary information about different business products made by those organisations. This information was then used in planning and controlling the manufacturing process. Moreover, this information helped in making decisions about potential business opportunities (Maskell, 1991).

The use of monetary based performance measures revealed shortcomings that have been well presented in many research studies. Sanger (1998), for example, referred to the usefulness of financial measures in demonstrating the profitability of a business. However, he claimed that by measuring the results of past activities, companies are provided with information about what has happened and fail to explain why it happened. Furthermore, Maskell (1991) classified these shortcomings into five categories; lack of relevance, cost misrepresentation, inflexibility, inability to progress in world class manufacturing and respond to the needs of financial accounting. Within this context, it is understandable why Johnson and Kaplan (1987) advocated that financial measures promote short-termism. According to Brown (1996), financial measures tend to focus on a company's present performance or on the performance in the very near future. Companies in this case might fail to address long term challenges, such as customer satisfaction, employee satisfaction and product or service quality, which could affect their competitive advantages (Brown, 1996). This fact also made

Ghalayini and Noble (1996) describe financial measures as “lagging metrics” because they are outcomes of decisions made in the past and therefore they describe the consequences of historical decisions. Other authors acknowledged that financial measures are backward looking and cover performance measures of the same nature making them belong to only one dimension in which case they do not provide sufficient information regarding different stakeholders’ needs and wants (Najmi *et al.*, 2005).

Another criticism of financial measures is that these types of measures do not encourage continuous improvement. Their function is mainly pushing managers to attain monetary targets without focusing on the means required to achieve those targets which may improve related business processes continuously (Turney and Anderson, 1989; Lee 2002). In a similar way, Kaplan and Norton (1992) claimed that senior organisational managers recognise that financial accounting measures provide misleading indicators that can adversely affect innovation and business development. In summary, the first phase of performance measurement development relied on monetary-based performance measures which performed well for the industrial era environment (Kaplan and Norton (1992). However, these measures are considered outdated in recognising skills and competencies that organisations need to cope a competitive environment.

This competitive environment in addition to the shortcomings of the traditional measures discussed above, marked the beginning of the second phase of performance measurement development (Ghalayini and Noble, 1996). Organisations needed to respond to the new challenges not only by altering their business strategies to move from low-cost manufacturing to quality, flexibility, short lead time and reliable delivery, but also by applying new technologies and developing new business attitudes to production management such as Computer Integrated Manufacturing (CIM), Flexible Manufacturing Systems (FMS), Just In Time (JIT) and Total Quality Management (TQM) (Ghalayini and Noble, 1996).

Producing competitive products has made non-financial performance measures rise to the same level if not one of more important than financial measures. Non-financial performance measures became significant tools used by operation staff for their every day management of production and distribution operations (Maskell, 1991). However, financial measures are still significant for external reporting purposes where the need

for reliable and integrated cost accounts and financial accounts remains in demand (Maskell, 1991) but the application of new approaches to production management, such as those mentioned above, showed the weaknesses of traditional performance measures and that companies need to develop new performance measures to regain their ability to operate in a highly competitive market.

Within this context, many authors introduced more “balanced” approaches to performance measurement that respond to the newly emerged thinking (Ghalayini and Noble, 1996). Neely *et al.* (2002) explained that the term “balanced” means that organisations need to use multi-dimensional measures to attain a balanced view of their business. These measures need to reflect a wide range of performance perspectives including internal and external, financial and non-financial performance in addition to identifying measures that drive the performance and consequently outcome measures.

Bititici *et al.* (2006) claimed that business improvement techniques, such as six sigma, lean production and the theory of constraints in addition to many performance measurement studies aimed at business improvement, help businesses improve by applying “formalised, balanced and integrated performance measures”. In this regard, Hoque and James (2000) claimed that using balanced measures encourages better performance than financial performance measures. They found that there is a positive correlation between using balanced non-financial measures and improved performance. In a similar way, Davis and Albright, (2004), in a study aimed to establish possible correlation between improvements in financial performance and applying balanced performance measures, found that a balanced set of performance measures can improve financial performance. They found that in one organisation, greater financial performance of divisions applying balanced measures was observed than in other ones which did not apply balanced measures. Moreover, Atkinson (2006) investigated using a balanced set of measures in order to develop a wider understanding of those measures’ role in implementing organisational strategies. She argued that a “balanced scorecard” can offer the means to implement organisational strategies by emphasising the relationship between organisational objectives and operational goals and identifying clear performance targets in addition to prioritising those targets at different hierarchal levels.

It is worth noting that using a comprehensive performance framework that covers financial and non-financial measures may not have impacts on business performance. Neely *et al.* (2004) conducted a study to investigate the performance impact of a balanced scorecard on organisations. They concluded that the changes in the performance of one organisation that apply a balanced scorecard were not considerably different to the changes in the performance of a sister organisation that did not in terms of sales growth and gross profit growth.

Research, on the other hand, showed that the effect of balanced measures on organisational performance depends on how they are used within an organisation. Braam and Nijssen (2004) claimed that using balanced measures can enhance the performance of an organisation if people responsible for the measurement know what is required to apply and use these measures such as involving multidisciplinary teams. The requirements of applying and using performance measures will engage a variety of functional areas within an organisation which could assist in creating momentum (Braam and Nijssen, 2004).

Expanding on this issue, Bititici *et al.* (2006) found that there is a link between the management styles of an organisation, its culture and performance measurement. They further explained that this relationship is “bi-directional”, which means that performance measurement can affect the way the organisational culture and management style are formed, and organisational culture and management and leadership style can, in turn, inform measurement of organisational performance.

While business professionals and academic researchers were attempting to tackle the shortcomings of financial performance measurement frameworks by paying more attention to the way that makes monetary measures more relevant, others advocated the need to develop operational measures such as “cycle time” and “defect rates” claiming that improved financial performance will follow (Kaplan and Norton, 1992). However, it is not wise to select either financial or operational measures because it has been found that senior managers do not depend on a sole group of measures and omit any others. They know that one set of measures will not offer the chance to know key areas of the business (Kaplan and Norton, 1992). Therefore, both financial and operational performance measures need to be used.

In conclusion, performance measures have developed from being of one dimension, which is the case of the monetary-based performance measures to more balanced and multi-dimensional measures that include financial and non-financial performance measures that promote continuous improvement such as productivity, customer satisfaction, product quality and flexibility (Brown, 1996; Marchand and Raymond 2008). In this regard, Grady (1991) said that:

“Performance measures need to be balanced. Balance includes internal measures with external benchmarks, cost and non-cost measures, result measures to assess the degree goals are achieved, and process measures to evaluate critical tasks and provide early feedback.”

2.4 Performance Measurement Frameworks

Frameworks include a set of performance measures, guidance and recommendations on the way they are used and the areas they need to focus on in order to help organisations measure their performance. Neely *et al.*, (2007) explained that organisations have developed and used performance measurement frameworks over the years to define criteria against which their performance will be evaluated. Moreover, operations management literature showed that performance measurement has become integral to business improvement (Moxham, 2009).

Since the mid-1980s the need for balanced multidimensional and improvement-oriented performance measurement frameworks has been established (Bititci *et al.*, 2005). Neely, *et al.* (2007) stated that in response to “calls from practice” for new and better ways of measuring organisational performance, the academic and consultancy communities have developed a plethora of performance measurement frameworks and methodologies. Among the most widely cited in the business management discipline are these frameworks:

- Du Pont Pyramid of Financial Ratios (Du Pont, 1910)
- Performance Measurement Matrix (Keegan *et al.*, 1989)
- Performance Pyramid (Cross and Lynch, 1991)
- Results and Determinants Model (Fitzgerald *et al.*, 1991)

- Balanced Scorecard (Kaplan and Norton, 1992)
- European Foundation for Quality Management (EFQM, 1992)
- Input, Processes, Outputs and Outcomes Framework (Brown, 1996)
- The Performance Prism (Neely *et al.*, 2000)

2.4.1 Du Pont Pyramid of Financial Ratios (1910)

The Du Pont pyramid of financial ratios is one of the earliest measurement frameworks developed at the beginning of the last century. The framework is based on a hierarchy of financial measures that identify relationships between different financial components of one organisation (Berndt, 2002). The ratios were constructed in such a way to form a pyramid or a tree of ratios which are used to calculate the financial benefits generated by that organisation (Murphy, 2005).

Du Pont performance pyramid revealed measurement deficiencies due to the over emphasis placed on measuring the different aspects of organisational performance in monetary terms (Rouse and Putterill, 2003; Anderson and McAdam, 2004). In a response to that problem, a framework has been developed and used for benefit quantification purposes. The new framework was developed by Greeff and Ghoshal (2004) who extended the pyramid at the bottom level to include quantitative performance indicators and their related influencing factors. Those influencing factors can be of qualitative nature which can be used to motivate and assess the outcomes of business initiatives.

2.4.2 Performance Measurement Matrix (1989)

As explained above, the pyramid of performance measures included performance measures that are monetary based. They were backward looking and lacked the ability to keep organisations up with the pace of changing business environment. Keegan *et al.* (1989) argue that organisations usually focus on their internal performance and allocate more time and effort to solve their problems than trying to benchmark their external performance. They concluded that performance measures have to reflect an organisation's multidimensional environment. Therefore, Keegan *et al.* (1989) introduced a balanced performance measurement matrix (Figure 2.1). They suggested, through this matrix, a number of performance measures categorised on internal,

external, cost-based, and non-cost based. The framework gives organisations the opportunity to enhance their competitive advantages by extending performance measurement to include measures that can express organisational focus on customer satisfaction, growth and production time.

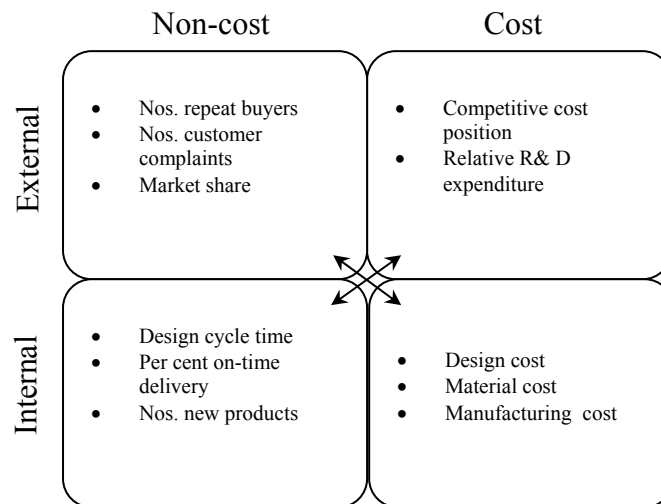


Figure 2.1: The performance Measurement Matrix (After Keegan *et al.*, 1989)

Marchand and Raymond (2008) claimed that this matrix is an operational performance measurement framework that takes into consideration the strategic objectives of an organisation and concentrates on satisfaction, time and cost reductions. Neely, (2002) similarly considered the matrix a simple and flexible model that has the ability to include various measures of performance. However, the matrix does not clearly explain potential relationships among the elements forming different dimensions of business performance (Neely *et al.*, 2000). In addition, the matrix does not show hierarchical structure of the performance measures which expresses integration across different business functions of an organisation, the same way the performance pyramid of financial ratios did.

2.4.3 Performance Pyramid (1991)

The performance pyramid was developed by Lynch and Cross in 1991 as a response to the growing need for more balanced measurement framework than the traditional performance measures that were expressed mainly in financial terms (Ghalayini and Noble, 1996). Another reason for developing this pyramid of measures was to create a management control tool to assist in defining and maintaining organisational

performance. The performance pyramid was illustrated as building blocks that are attached together to form a performance information network (Lynch and Cross, 1995).

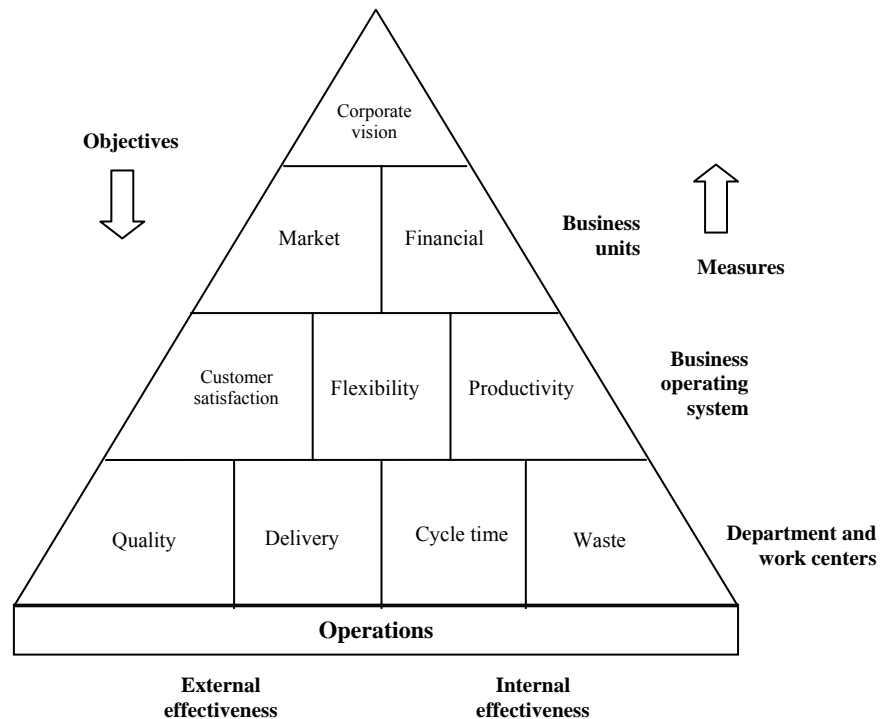


Figure 2.2: Performance Pyramid (After Cross and Lynch, 1995)

The framework consists of four levels forming a pyramid of objectives and measures (Figure 2.2). Effective linkages between strategy and operations are expressed by disseminating strategic objectives of an organisation vertically through the levels from the top down, and then, assigning measures to those objectives from the bottom up (Lynch and Cross, 1995). A vision for the organisation is developed and stated at the top level of the pyramid by the organisation's senior management. At the next level, objectives for every business unit are established in market and financial terms. Strategies are consequently devised, explaining the way those objectives should be attained. Additional operating objectives can be identified for key processes supporting the business strategy. These objectives need to be articulated in terms of customer satisfaction, flexibility, and productivity forming the third level of the pyramid. At the foundation level of the framework, objectives are translated into detailed operational criteria such as quality, delivery time and waste (Lynch and Cross, 1995).

Lynch and Cross (1995) pointed out two main characteristics of the pyramid. First, it is a useful method to explain the way objectives are disseminated from senior

management of an organisation through to the operators. Second, it shows the way the performance measures are populated with data from the bottom level of the pyramid upwards. Based on this, Anderson and McAdam (2004) consider that using this system assists in monitoring organisational performance as performance information is transmitted upwards and downwards between the levels.

The framework can be looked at from two distinctive perspectives; external effectiveness and internal efficiency. The first one can be looked at be external stakeholders who might be interested in measures such as customer satisfaction, quality and delivery time. The other perspective can be looked at internally and cover measures that focus on an organisation's production such as cycle time and waste (Neely *et al.*, 2000; Anderson and McAdam, 2004).

Ghalayini, Noble (1996) and Rouse and Putterill (2003) found that the pyramid's four levels concentrate on internal efficiency and external effectiveness of an organisation and that the pyramid is a valuable tool for demonstrating organisation's performance because it includes measures that link strategic objectives to operational activities. Likewise, Neely *et al.* (2000) highlighted that expressing the connection between strategic objectives to operational activities is a strength of the performance pyramid. In this regard, Ballantine and Cunningham (2001) agreed that the pyramid is an effective means to show and develop the connection between the strategies of an organisation and its operations. In addition, it can be inferred from Rouse and Putterill (2003) that the pyramid has a notion of causality in that internal efficiency of organisational performance can have an impact of the external effectiveness of the generated products and the way a customer and other external stakeholders might perceive them.

It is important to note that one of the weaknesses of the pyramid is that it does not sufficiently reflect employees' perspective and criteria such as employee satisfaction and motivation are missing. This could be why the performance pyramid is difficult to operationalise (Neely *et al.*, 2000)

2.4.4 Results and Determinants Model (1991)

Acknowledging the fact that appropriate strategies are needed to guide organisations through competitive business environments, Fitzgerald *et al.* (1991) suggested that managers, when designing business strategies, should pay particular attention to economic atmosphere, client requirements, shareholders expectations, personnel requirements and the use of available resources. Those areas of attention, based on a synthesis of performance criteria that are developed by different authors in the management field, form a standard for six general performance dimensions (Fitzgerald *et al.*, 1991). Those dimensions are illustrated in Table 2.1.

Results	Financial performance
	Competitiveness
Determinants	Quality
	Flexibility
	Resource utilisation
	Innovation

Table 2.1: Results and Determinants Framework (After Fitzgerald *et al.*, 1991)

Fitzgerald *et al.* (1991) advised that performance measures are required to assist in implementing and developing those strategies. Therefore, the group of performance measures have to reflect all the proposed performance dimensions. Besides, Fitzgerald *et al.* (1991) pointed out that their six performance dimensions can be divided into two distinctive parts. The first part expresses the criteria that define the success of the selected strategies. This part includes the competitiveness and financial dimensions, and referred to as the ‘results’ part. The second part explains the factors that assist in achieving success. Therefore, those factors are referred to as ‘determinants’. The ‘determinant’ part includes the rest of performance dimensions that cover flexibility, resource utilisation and innovation.

Franco-Santos (2007) identified a particular strength of this results-determinants model. The model shows the notion of causality. This notion is expressed by Rouse and Putterill (2003) who considered that measures of financial performance and competitiveness are related to results whereas measures of quality, resource utilisation and innovation are related to causes. Besides, the model shows that the results gained at

one particular time are the main consequences of past business performance, considering specific determinants. Within this context, results are considered as lagging indicators and determinants are considered as leading indicators (Neely *et al.*, 2000).

In addition, Franco-Santos (2007) made the point that this results-determinants model summarises a concept suggesting that the design and deployment of performance measurement systems necessitates identifying the drivers of performance so that the required performance outcomes can be achieved. It is important to note that the results-determinants model echoes other concepts of causality such as Cross and Lynch performance pyramid (Rouse and Putterill, 2003). Moreover, the Cross and Lynch performance pyramid shows a hierarchal structure that can be beneficial for different organisational level.

2.4.5 The Balanced Scorecard (1992)

In an attempt to find a suitable measurement framework that avoids placing too much emphasis on financial measures and, at the same time, responds to many researchers and practitioners calling for improving business performance measures, Kaplan and Norton developed a “balanced scorecard” (BSC) that incorporates financial measures in addition to operational measures reflecting customer satisfaction, internal business processes, and an organisation’s innovation and development activities (Kaplan and Norton, 1992). The balanced scorecard consists of four perspectives (Figure 2.3):

- Financial perspective
- Internal process perspective
- Innovation and learning perspective
- Customer perspective

The financial and customer perspectives were anticipated to respond to the needs of stakeholders and target groups. They were comprised of measures such as sales, profit, market share and customer satisfaction. The internal processes perspective gives attention to the business operations that are significant for customer satisfaction and efficiency. This perspective may include measures such as cycle time and unit cost data. Organisation’s innovation and improvement perspective focus on the ability of an

organisation to continuously develop and add value to its customers and shareholders (Kaplan and Norton, 1992; Rouse and Putterill, 2003).

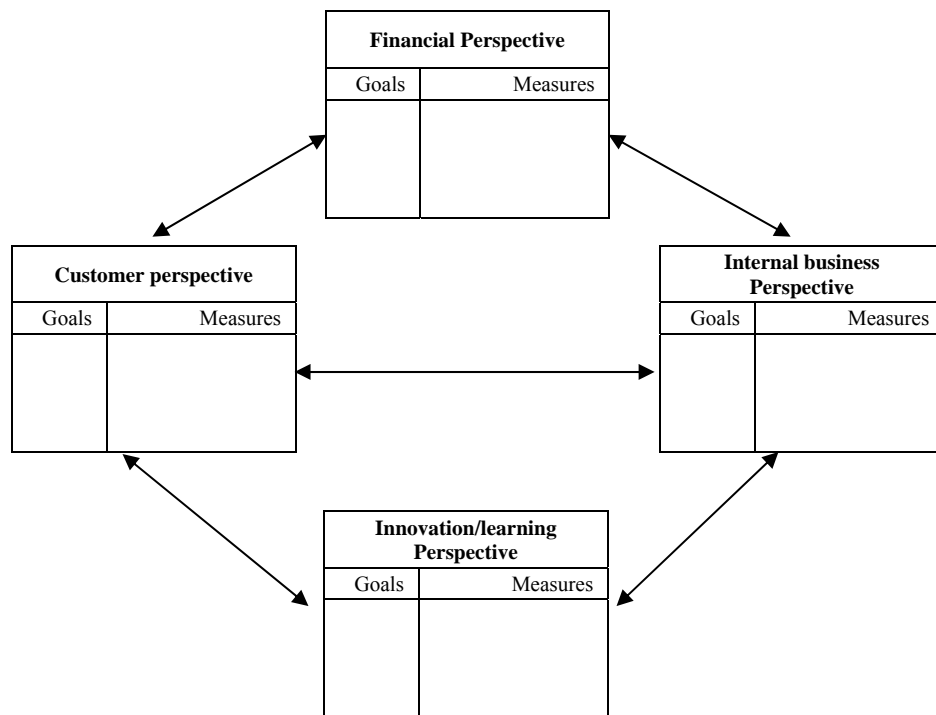


Figure 2.3: The Balanced Scorecard (After Kaplan and Norton, 1992)

The BSC is considered one of the most widely recognised and used performance measurement frameworks in business since its inception (Sousa, 2005). It is popular because it has a number of advantages. Neely *et al.* (2000) pointed out that one of the strengths of BSC is the clear relationships between the four performance perspectives. These four perspectives of the balanced scorecard can not only they provide senior management with a comprehensive view about what they need to know of their organisation's performance, but they are interrelated in that operational measures form the drivers to improved financial performance (Bourne *et al.*, 2002). Within this context, Wongrassamee *et al.* (2003) and Davis and Albright (2004) claimed that a major strength of the balanced scorecard approach is the emphasis it places on linking performance measures with business unit strategy. The four perspectives of the BSC link current organisation's activities to its future objectives by translating an organisational vision into operational terms, communicating the strategy throughout the organisation and linking it to departmental and individual objectives, business planning, and feedback and learning. Another strength was expressed by Neely *et al.* (2000); the

BSC tries to integrate different categories of business performance such as financial performance, production performance and customer satisfaction which is similar to what Keegan's performance matrix was trying to achieve.

Kennerley and Neely (2002) and Neely *et al.*, (2005, p1244) identified a significant perspective that is missing from the balanced scorecard which is the competitor perspective. They explained that depending on the BSC set of measures alone would not allow an organisation to address "one of the most fundamental questions of all – what are our competitors doing?" However, the balanced scorecard has also been criticised for not clearly determining the relationship and trades-off between its four performance dimensions (Bond, 1999). In other words, the BSC does not show explicitly the causality notion as seen in the Fitzgerald *et al.* model and to some extent in Lynch and Cross performance pyramid (Rouse and Putterill, 2003). Nonetheless, the balanced scorecard lacks the means to measure aspects of human resources, employee satisfaction, supply chain performance, product and service quality and environmental and community perspective (Anderson and McAdam 2004).

2.4.6 The European Foundation for Quality Management Excellence Model (1992)

The European Foundation for Quality Management (EFQM) Excellence Model was launched in 1992 and has been used by organisations for systematic evaluation and measurement of their business performance (Oakland and Marosszeky, 2006). The Excellence Model was developed on the basis of total quality management (TQM) principles (Hides *et al.*, 2004).

The EFQM Excellence Model is comprised of nine criteria (Figure 2.5). The framework has two distinctive parts of performance aspects known as enablers and results. The idea behind this Excellence Model is that "the enablers are the levers that management can pull to deliver future results" (Neely *et al.*, 2000). In other words, the 'Enabler' criteria refer to what an organisation does and the 'Results' criteria refer to what an organisation achieves (EFQM, 2007). In fact the European Foundation for Quality Management identified the link between the two parts of the Excellence Model by stating that that 'Results' are caused by 'Enablers' and 'Enablers' are enhanced by feedback from 'Results'. This idea was taken one step further by Bou-Llusar, *et al.* (2005) who

investigated the causal relationship in the EFQM Excellence Model. They found that enablers and results are strongly associated.

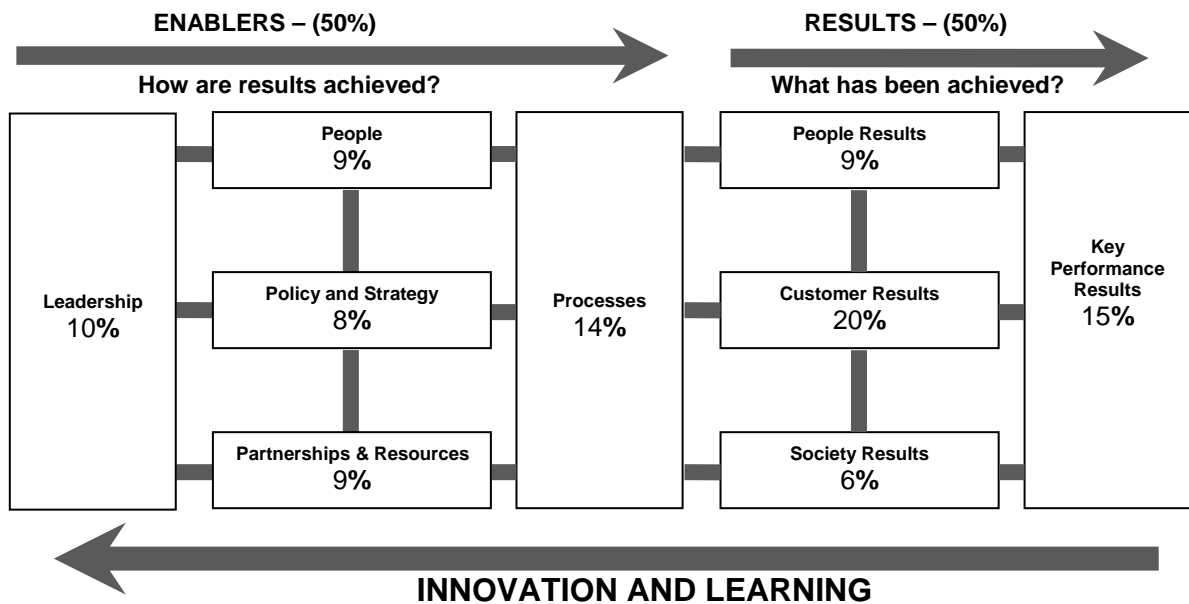


Figure 2.4: EFQM Excellence Model (After Franceschini *et al.*, 2007)

The EFQM follows a scoring system that gives equal weight to “enablers” and “results”. They both have a weight of 50%. Their nine criteria have different weights (Figure, 2.4). One feature of the EFQM Excellence Model that distinguishes it from other measurement frameworks is that it includes an additional perspective referring to the impact of a business on society (Oakland and Marosszeky, 2006).

Although EFQM Excellence Model has gained much popularity, it shows some weakness as being difficult to implement (Wongrassamee *et al.*, 2003; Neely *et al.*, 2000). This long-term nature of performance improvement that organisations need makes the Excellence Model inappropriate for “quick fixes” (Hides *et al.*, 2004). In addition, the Excellence Model does not recommend certain strategies or plans required for continuous improvement and to manage and control organisational performance successfully (Wongrassamee *et al.*, 2003).

2.4.7 Macro Process Model (1996)

Brown (1996) asserted that the performance dimensions need to reflect a balanced view of the business shareholders, stakeholders, customers and personnel. In addition Brown (1996) emphasised that when designing performance measures, they need to reflect past and future actions. Hence, another performance measurement framework was introduced by Brown (1996) who suggested that any measurement framework should include six dimensions. These dimensions are:

- Financial performance
- Product/service quality
- Supplier performance
- Customer satisfaction
- Process and operational performance
- Employee satisfaction

It can be inferred from Brown's framework that he tried to counter the criticism of the balanced scorecard for lacking emphasis on employees and not covering the supply chain side of the business. Therefore Brown (1996) presented two dimensions reflecting the shortcomings of the balanced scorecard (BSC). However, the innovation and learning dimension, which is prominent in the BSC, has not been explicitly highlighted in Brown's framework.

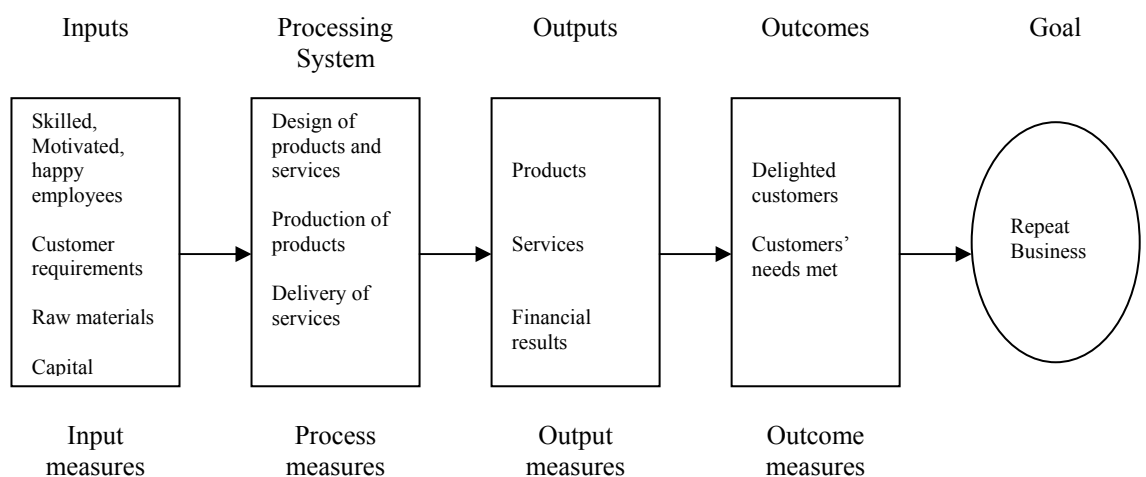


Figure 2.5: Inputs, Processes, Outputs, Outcomes (After Brown, 1996)

Brown (1996, p.95) put particular emphasis on the Process and operational performance dimension because he considered "*the key to excellence in any organisation is control*

of its processes to produce reliable and consistent products and services". As a result, Brown (1996) presented the 'Macro Process Model' to show the link between five stages in a business process and their performance measures (Figure 2.5). The five stages are inputs, processing system, outputs, outcomes, and goals. Brown suggested that every stage is a performance driver of the next. Within this context, Brown took the concept of connecting performance measures through cause and effect linkages one step further ahead of the BSC (Franco-Santos, 2007).

Neely *et al.* (2000) considered Brown's framework useful because it depicts the distinction between the five stages of a business process and consequently between their measures. While the concept of the model is well structured and functional, Brown's framework is considered a process-based framework as opposed to the hierarchically focused frameworks (Neely *et al.*, 2000).

2.4.8 The Performance Prism (2001)

Powell (2004) claimed that performance measurement frameworks such as the balanced scorecard, the performance pyramid and the results and determinants model do not sufficiently focus on stakeholders like employees inside an organisation, and suppliers and other alliance partners outside the organisation.

The Performance Prism was designed by Neely *et al.* (2001) to reflect wider stakeholders' views so that the increasing demand for satisfying stakeholders needs can be met (Powell, 2004). Similar to the balanced scorecard, the performance prism addresses the needs of stakeholders. The difference is that while the BSC focuses on two stakeholders (shareholders and customers) the performance prism includes employees, suppliers, intermediaries, regulators and communities as stakeholders (Adams and Neely, 2000). Sousa (2005) argued that identifying what satisfies stakeholders can guide an organisation to improve the business in such a way that will increase stakeholders' satisfaction.

The performance prism consists of five interconnected perspectives (Figure 2.6):

1. Stakeholder satisfaction (focus on identification of stakeholders and their requirements);

2. Strategies (focus on developing business strategies required to achieve stakeholders' objectives);
3. Processes (focus on processes needed to achieve business strategies);
4. Capabilities (focus on human and non-human resources needed to complete business processes); and
5. Stakeholder contributions (focus on identifying areas that need continuous attention and input from stakeholders)

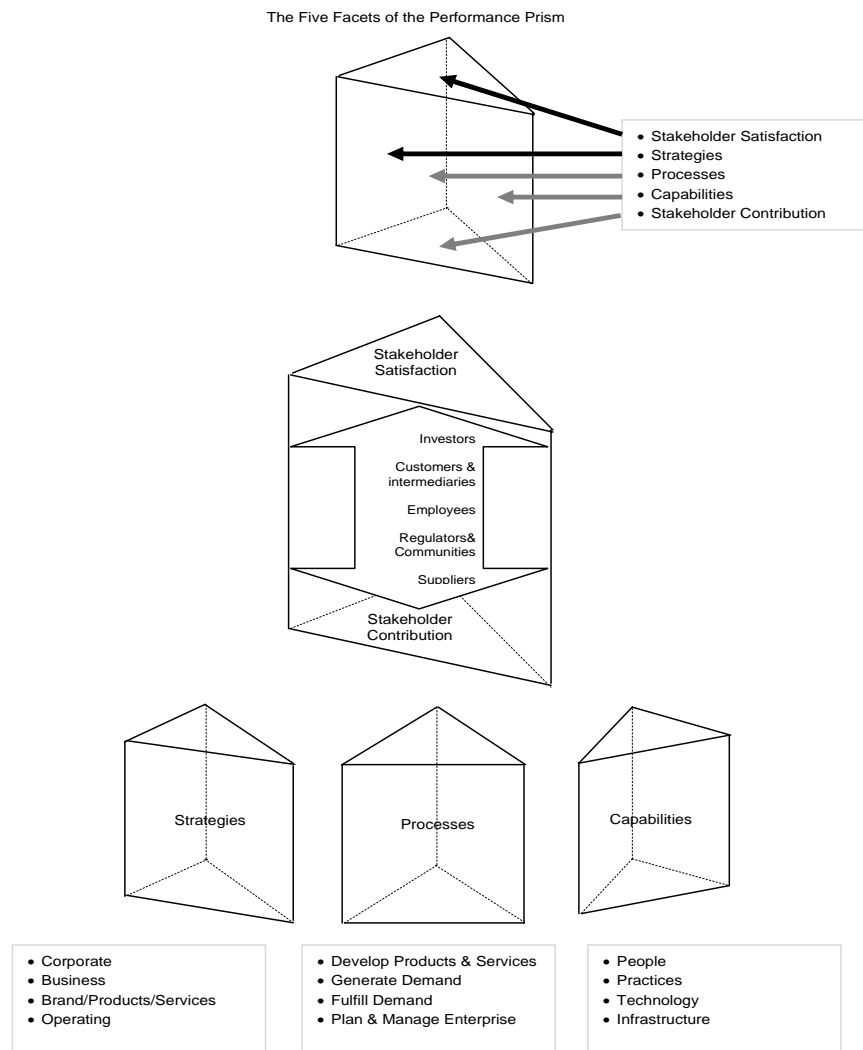


Figure2.6: The Performance Prism (After Neely *et al.*, 2001)

Neely *et al.* (2001) asserted that the traditional assumption that performance measures need to be derived from strategy is not completely correct. It can be challenged by the concept performance measures should reflect the needs and wants of the stakeholders because organisations develop strategies to create value for stakeholders. Therefore, by

focusing on stakeholders, the performance prism shows that it considers the views of a wider range of players, who are affecting in or affected by the business, such as investors, customers, employees, regulators and suppliers, more than other performance frameworks do (Tangen, 2004).

Besides the strong points in the performance prism, which have been mentioned above, it shows a number of limitations. Tangen (2004) pointed out that it does not provide sufficient information about the process by which performance measures are designed to meet the different performance perspectives. This criticism is similar to the one raised by Medori and Steeple (2000) who found that the majority of performance measurement frameworks, including the performance prism, do not show enough directions for choosing and implementing performance measures.

2.5 Performance Measurement Characteristics

In order to develop a performance measurement framework, it is wise to follow recommended steps highlighted by a number of authors who summarise the characteristics of the performance measures and those of measurement frameworks, and who underline emerging issues and challenges surrounding their development. Within this context, Folan and Browne (2005) claimed that recommendations concerning performance measurement can be split into two main areas:

- recommendations for the design of a performance measurement framework; and
- recommendations for performance measures.

They explained that the first area concentrates on the requirements of what constitutes good performance measures, while the second explores the recommendations that have been advocated relating to the design and development of performance measurement frameworks and systems (Folan and Browne, 2005). However, there is an important part that was omitted which is related to recommendations for the process of measuring the performance.

A comprehensive review of performance measurement literature yielded a long list of performance measurement characteristics. The list included many recommendations that

were either duplicated or had similar meanings. A shorter list was produced including three categories of critical recommendations. The three categories focused on the overall structure of measurement frameworks, performance measures and the measurement process (Tables 2.2, 2.3 and 2.4). This developed list of recommendations will be used in later stages of this study as criteria for validation.

Comprehensive	Keegan <i>et al.</i> (1989); Fitzgerald <i>et al.</i> (1991); Kaplan and Norton (1992); Brown (1996); Neely <i>et al.</i> (1997); Najmi (2005); Bititci <i>et al.</i> (2005); Cocca and Alberti (2010)
Balanced	Keegan <i>et al.</i> (1989); Maskell (1989), Bititci <i>et al.</i> (2005), Kaplan and Norton (1992); Brown (1996); Neely <i>et al.</i> (1997); Cocca and Alberti (2010)
Adaptable	Maskell (1989); Ghalayini and Noble (1996); Neely <i>et al.</i> (1997);

Table 2.2: Recommendations for overall structure of measurement frameworks

Relevant – Derived from strategy	Globerson (1985); Maskell (1989); Lynch and Cross (1991); Fitzgerald <i>et al.</i> (1991); Kaplan and Norton (1992); Neely <i>et al.</i> (1997); Hudson <i>et al.</i> (2001); Bititci <i>et al.</i> (2005); Cocca and Alberti (2010)
Understandable	Neely <i>et al.</i> (1997); Hudson <i>et al.</i> (2001); Cocca and Alberti (2010)
Effective - useful	Bititci <i>et al.</i> (1997); Neely <i>et al.</i> (1997); Hudson <i>et al.</i> (2001); Cocca and Alberti (2010)
Useful – Relevant	Ghalayini and Noble (1996); Hudson <i>et al.</i> (2001); Cocca and Alberti (2010)
Focused on improvement	Fitzgerald <i>et al.</i> (1991); Ghalayini and Noble (1996); Kaplan and Norton (1992); Neely <i>et al.</i> (1997); Hudson <i>et al.</i> (2001); Bititci <i>et al.</i> (2005)

Table 2.3: Recommendations for performance measures

Simple	Ghalayini and Noble (1996); Hudson <i>et al.</i> (2001)
Clear	Globerson (1985), Neely <i>et al.</i> (1997); Najmi (2005)
Feasible	Neely <i>et al.</i> (1997); Cocca and Alberti (2010)
Applicable	Neely <i>et al.</i> (1997); Ghalayini and Noble (1996)

Table 2.4: Recommendations for performance measurement process

Although there have been many research studies trying to identify the characteristics of performance measures, researchers still find several challenges when developing

appropriate performance measures (Moxham, 2009). One of the difficulties is selecting the right measures. Powell (2004) explained that between the 1980s and 1990s the challenge in a lot of organisations was that they measured the wrong things as the focus was measuring things that were simple to measure. Those measures tended to be of financial and historical nature. She added that, this sort of problem has changed and organisations nowadays face another difficulty which is “excessive measurement”; the desire to quantify everything. In other words, the new challenge is in identifying what is required to be measured so that the focus will be on what is completely critical (ibid).

Likewise, Bourne *et al.* (2002) pointed out that the challenge concerned with developing appropriate measures is considered as a barrier to implementing a performance measurement system. In fact, they revealed in a study that there are an additional three barriers which can influence the process of measuring the performance of an organisation. They referred to difficulties with data access, time and effort required to collect data, and consequences of performance measurement from employees’ perspective.

2.8 Conclusion

The discussion in this chapter showed that performance measurement is considered as a significant management tool that organisations use to compete in an ever changing environment. In addition, the literature showed that the subject of performance measurement has been extensively researched and consequently, various performance frameworks and systems have been developed to assist in driving performance on organisational and project levels. The development of performance measurement progressed from narrowly focused measures to multi-dimensional measures to attain a balanced view of business and reflect a wide range of performance perspectives including internal and external, financial and non-financial performance in addition to identifying measures that drive the performance and consequently outcome measures. In other words, performance measures have developed from being of one dimension, which is the case of the monetary-based performance measures to balanced and multi-dimensional measures that include operational and customer oriented measures that promote continuous improvement such as productivity, customer satisfaction, product quality and flexibility. Furthermore, studies showed that there is a positive correlation

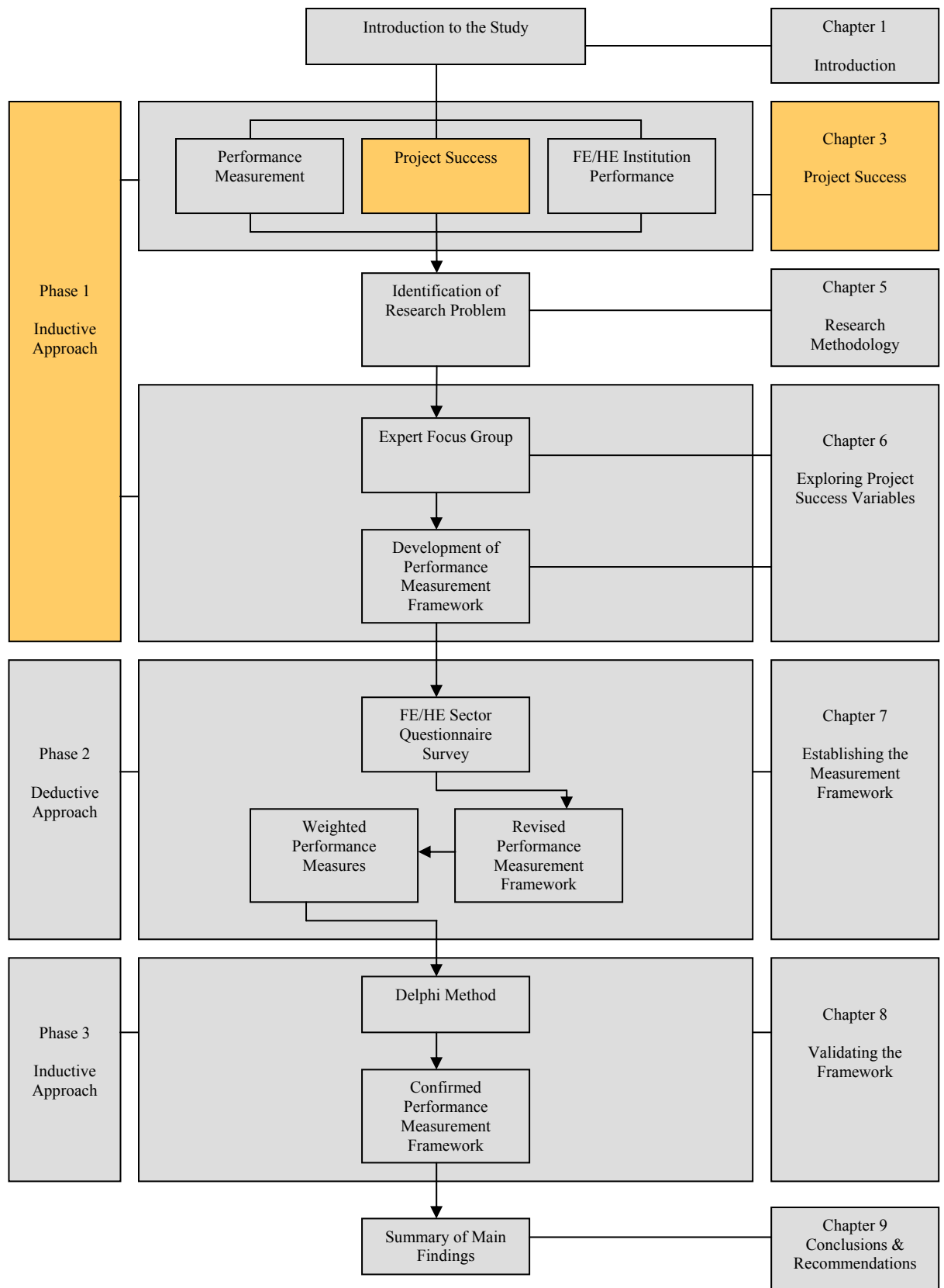
between using balanced non-financial measures and performance improvement. Therefore, in response to “calls from practice” for new and better ways of measuring organisational performance, the academic and consultancy communities have developed a plethora of performance measurement frameworks.

Apart from the Du Pont pyramid of financial ratios, the other performance measurement frameworks are similar in that they are encouraging organisations to improve their performance by involving different organisational structures in the process. In addition, performance frameworks such as the Deming Prize, balanced scorecard and EFQM share the emphasis on organisational continuous improvements.

Characteristics of performance measures and measurement frameworks were highlighted. The review above showed that they include a wide range of measures that represent multiple performance dimensions reflecting the interests of the business organisation. In addition, more recent studies (Neely *et al.*, 2007) demonstrated that performance measures are required to expand to reflect wider stakeholders, such as employees, suppliers and other alliance partners. This creates conflict of interests. Tangen (2005) explained that requirements of stakeholders may not be constantly compatible with one other, which makes compromise unavoidable.

Another similar problem is the contrast between the requirements for the performance measures themselves; they are required to be designed in such a way that makes them as exact as possible. As a consequence to this requirement, a very complex formula could be formed. On the other hand, it is recommended that performance measures have to be easy to measure and easy to understand, which are arguments for using straightforward formulas (Tangen, 2005).

Chapter 3: Project Success



Chapter 3: Project success

3.1 Introduction

The last chapter focused on how organisational performance can be measured. It highlighted the development of different performance measurement frameworks, the general characteristics they have in common, and recommendations for designing performance measures. It formed the foundation for exploring performance measurement in construction. The construction industry, as literature in this field shows, has adopted a number of well established measurement frameworks from other industries. This is particularly important when considering its nature that is based on undertaking projects as performance measures can be indicators of project success.

This chapter explores project success as it has been approached by different researchers. It investigates different project definitions and adopts one that recognises the impact of a project to its organisation through considering its place within core organisation business. This chapter also reviews project success criteria and dimensions for general projects and for construction projects and suggests a comprehensive measurement framework for project success in construction. This framework will be used in later stage of the study in developing a comprehensive measurement framework for FE/HE co-location projects.

3.2 Project Definition

To understand project success, the term ‘project’ must be defined. The Project Management Institute (PMI, 2004, p5) defines a ‘project’ as *“a temporary endeavour undertaken to provide a unique product or service”*. The British Standards Institution (BS 6079-1, 2006, p2) defines a ‘project’ as *“a unique set of co-ordinated activities, with definite starting and finishing points, undertaken by an individual or organisation within defined schedule, cost and performance parameters.”* A comprehensive project definition is provided by Turner (2009) who considered a ‘project’ to be *“an endeavour in which human, financial and material resources are organised in a novel way to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives”*. These definitions describe certain characteristics that projects have in common, namely: objectives; constraints in terms of time and resources; and the

uniqueness of their output. Kerzner (2009, p2) summarised those common characteristics by stating that “a project can be any series of activities and tasks that:

- *Have a specific objective to be completed within certain specifications;*
- *Have defined start and end dates;*
- *Have funding limits;*
- *Consume human and nonhuman resources; and*
- *Are multifunctional.”*

Kelly (2005) referred to the fact that although there are many definitions of projects in the literature, none of the definitions investigated the role of the project in relation to client’s business. Kelly (2005, p12) concluded that the definition of a project should be “*investment of resources for return*”. He further defined the investment as “*being financial, manpower and/or material*” and the return as being “*commercial or social*”. Kelly (2005) further suggested that the project has, in addition to the common characteristics highlighted by different authors, a smooth integration into the core business of the client. This concept will be adopted in this study because it recognises that a project is initiated to add value to client’s core business. The implication of this definition is that it implies that a project’s full potential can only be realised long time after its completion. This definition is applicable to projects in any sector including the construction industry (Kelly, 2005). The place of the project within the client’s business is shown in Figure 3.1.

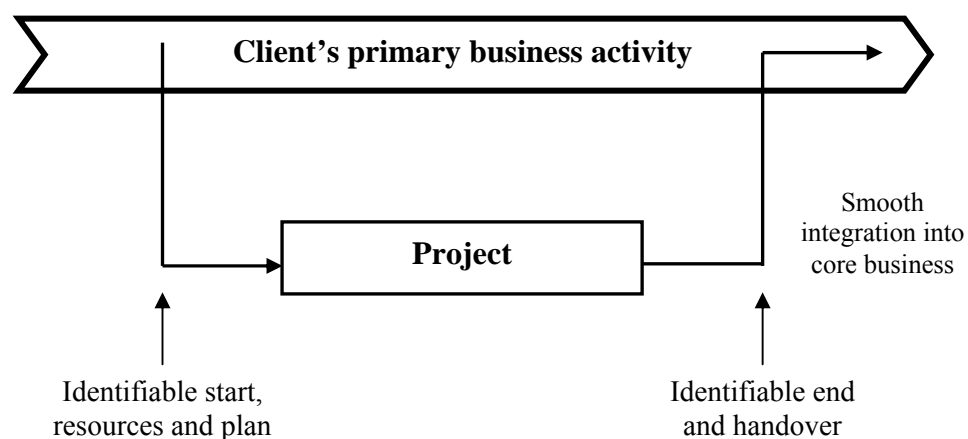


Figure 3.1: The Place of a Project within a Client’s Business (After Kelly, 2005)

3.3 Characteristics of Construction Projects

The previous section presented a general definition of a project extracted from literature related to project management per se. In construction, projects have been defined in a similar way. Fewings (2005) used the BSI project definition to point out that it can be applied to many industries including construction. In addition, Kwakye (1997, p.21) stated that:

“A construction project is a task undertaken in the production of construction products covering total activity from inception to commissioning and occupation, involving an agreed and planned objective and input of specialist participants and their interrelationships. It is a temporary non-recurrent activity which is started, implemented, evaluated and terminated”.

What differentiates the construction industry is that projects create unique outputs even though the different kinds of construction projects, such as commercial, educational, residential or infrastructure projects have the same project life cycle (Wegelius-Lehtonen, 2001).

The reports of Latham (1994) and Egan (1998) shed light on these characteristics of the construction industry. They concluded that fragmentation, inefficiency in coordinating and securing good communication between parties, and the absence of a structured process to learn and increase effectiveness were key characteristics of the industry and the main reasons for its underperformance. Similarly, Ballard and Howell (1998) pointed out that construction projects are distinguished by two characteristics:

- They fall into the category of “fixed position manufacturing” which means that product assembly has to be carried out on site;
- The product is rooted in place so that project teams and relationships with customers and surrounding community can be affected the construction process.

Koskela (1992) considered that the one-of-a-kind nature of construction projects, site production, and the temporarily-formed organisation usually prevent construction

processes from flowing efficiently the same way processes do in other industries. In this regard, Walker (2007) asserted that construction projects are usually performed by a number of different organisations, which change from project to project. This temporary coalition creates the likelihood for conflicts between the needs of each involved organisation and those of the project. It also reveals diverse perceptions about executing the project to achieve its objectives (Turner, 2009). Furthermore, all the key participants in a construction project such as the architect, structural and mechanical engineers, the contractor and subcontractors, look at the construction process from their own perspective resulting in further differentiation (Wegelius-Lehtonen, 2001). In this context, Gould and Joyce (2008) referred to the “demanding challenge” of the construction industry that results from assembling many autonomous businesses into same-objective and directed process.

The unique characteristics of construction projects determine the way that successful projects must be looked at. In the next section, a review of project success literature is performed to examine the ways by which success can be determined.

3.4 Project Success

The concept of project success has been widely discussed in the project management literature and researchers have attempted over the years to define how success, which is a concept that means different things to different people, can be determined. Project success has often been linked to the project participants’ goals and expectations which can be technical, financial, educational, social and/or professional in nature (Parfitt and Sanvido, 1993).

For some researchers, success means exceeding project results (Ashley *et al.*, 1987). For others, success is merely meeting project objectives (Tuman, 1986). Hence, project success is associated with an assessment of whether certain objectives, expectations, outcomes or some other set of determinants have been achieved. In other words, project success is associated with the achievement of certain criteria. Within this context Lim and Mohamed (1999, p243) defined success criteria as “*the set of principles or standards by which project success is or can be judged.*”

Early studies, such as Gaddis (1959) showed that a project is considered successful if the criteria of finishing it on time, within budget and to predetermined specifications (quality) are met. These three criteria of time, cost and specifications have been termed as the “Iron Triangle” according to Atkinson (1999) because of their presence, as permanent components of project success, in almost every project. These criteria can easily be measured and therefore, they provide useful and tangible information to the project organisation (Pinto and Slevin, 1988). However, measuring project success on the basis of these three criteria only may lead to deficient and misleading judgement (Shenhav *et al.*, 2007a) because they do not appropriately reflect the client’s need for the project to create competitive advantage (Shenhav, 2007). Therefore, projects should not be looked at as activities separate to the client’s business which try to achieve short-term objectives. They need to be dealt with as long-term strategic initiatives (Andersen *et al.*, 2006) through which organisations implement their plans and achieve their objectives (Shenhav *et al.*, 2007b).

The challenge that faced researchers and project management professionals was that in some cases, the ultimate result of a project may be judged a failure even though the project has been produced on time, within budget and meets its predetermined specifications. In some other cases, the project execution could finish overtime or over budget but the project would still be considered a success (Pinto, 2007). Pinto and Slevin (1988) indicated that an additional component related to client satisfaction with the project was needed in addition to the three criteria of time, cost and specifications. They argued that the increasing number of design and construction companies and the wide range of project management techniques and services that these companies provide, gave the client the opportunity to choose from a variety of choices. This fact made client satisfaction a significant success criterion. It also made design and construction companies more interested in sustaining relationships with previous clients as a means for keeping their market share.

Other scholars have tried to find an explanation to this phenomenon. Pinto and Slevin (1988) considered that project success has two ‘themes’: Projects and Clients. The first theme (Projects) comprises of three criteria (time, cost and performance). The second theme (Clients) has three criteria too (use, satisfaction and effectiveness). The two themes, however, show that project success should be viewed from two perspectives;

the project organisation perspective and client (or the end-user) perspective. This view was supported by Navarre and Schaan (1990) who also claimed that the priority of the project in the client organisation could determine project success even though the project performance does not meet the traditional success criteria of time, cost and specifications. This view reflects the strategic importance of projects within their organisations which has an impact on the overall success. De Witt (1988) considered that using the project time, cost and specifications as a success criterion may show effective project control and management, but project success needs to be linked to meeting the project's broader objectives. Therefore, when measuring success, attention is needed to differentiate between project management success and project success (de Wit, 1988):

- *Project management success* which is assessed against the traditional time, cost, and quality criteria, and
- *Project success*, which is assessed against the specific objectives of the project

He further explained the relationship between the two by saying that “*good project management can contribute towards project success, [but] it is unlikely to be able to prevent failure.*” (de Wit, 1988, p. 164).

Other researchers such as Pinto and Pinto (1991) criticised that project success has been constantly measured on the basis of whether or not the project achieved the task(s) it was supposed to achieve. They claimed that the focus had centred on the outcomes of project tasks using the time, cost and specifications criteria and there was little focus on extending the concept of project success to cover intangible perspectives of the implementation “process” such as *psycho-social* outcomes (e.g. the relationships among the project team members). Project success, according to Pinto and Pinto (1991) comprises two components:

Project Task Outcomes:

- Adherence to budget
- Adherence to schedule
- Level of meeting specifications
- Likelihood of usage by clients

Project *Psycho-Social* Outcomes:

- Satisfaction of interpersonal relations with project team members
- Perceived experience of the project

Another view is represented by Shenhar *et al.* (2000) who suggested that projects can be classified into strategically managed projects, and operationally managed projects. Shenhar *et al.* (2000, p2) explain the difference by stating that: “*Strategically managed projects are focused on achieving business results, while operationally managed projects are focused on getting the job done.*” Therefore, project success need to be looked at from these two different angles. This view corresponds to other views such as the one that considers that projects should not be looked at in isolation a product lifecycle, or with another view that calls for the distinction between project success and project management success (de Wit, 1988).

A more comprehensive view was introduced by Freeman and Beale (1992) who viewed project success through the link between the creation of the investment assets (the ‘project’) and the consequent operation of those assets to attain certain benefits. In their view, the project is part of the investment process of a broader business venture (Figure 3.2).

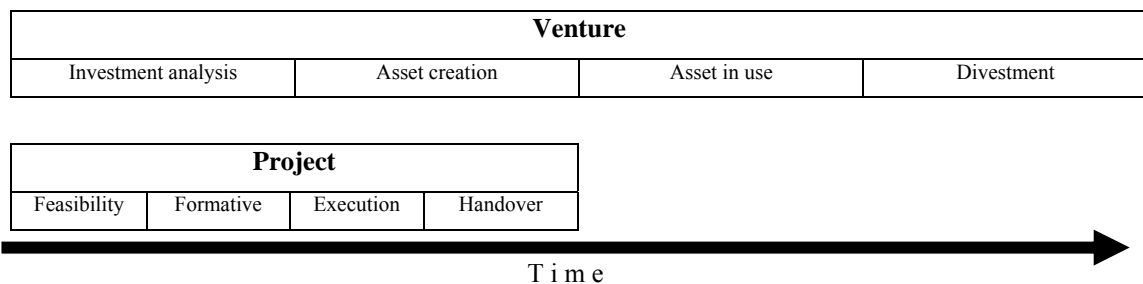


Figure 3.2: Venture versus Project Lifecycle (After Freeman and Beale, 1992)

Turner (2009) developed a similar idea about the relationship between initiating projects and the output they produce. He explained that projects are undertaken for a purpose: projects are the means to get some output or to obtain a facility that could be a new building, manufacturing factory, computer system, or any other product that a client wants. Nevertheless, a product is created to generate benefits and to satisfy client needs.

Consequently, it is necessary to consider the end results and the benefits the project creates for the client in the short, medium and long-run when deciding whether a project is successful. Likewise, Atkinson (1999) used to time scale divide project success into two main stages as described in Figure 3.3. The first is the “delivery stage” which covers the process of doing the project correctly. The second is the “post delivery stage” which in turn has two dimensions. The first dimension considers the business that will be performed as a result of undertaking the project. The second dimension considers the benefits generated by doing the business.

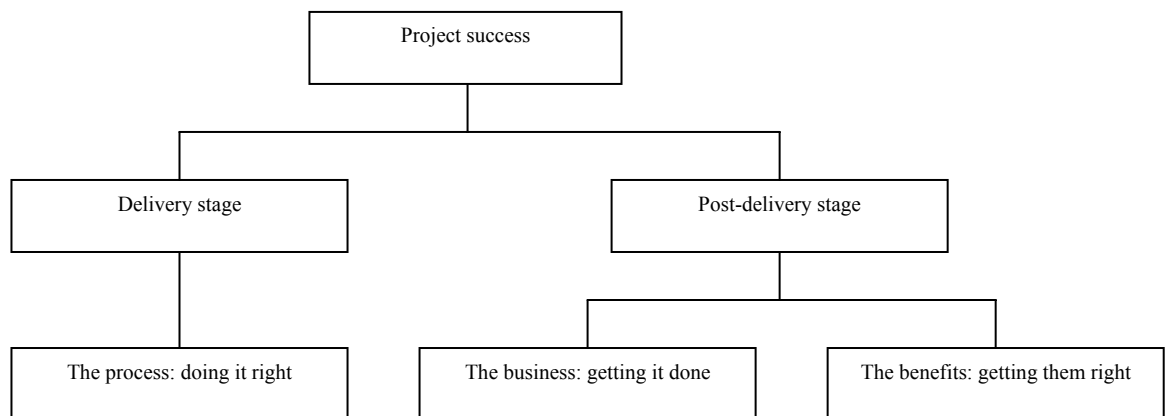


Figure 3.3: Project Success Dimensions (Adapted from Atkinson (1999))

Other studies concerning project success started to focus on time-based criteria. This concept is based on the idea that project benefits and expectations can take a long time before they are realised (Shenhar *et al.*, 2007a). Therefore, project success needs to be measured in the short, medium and long term. For example, Shenhar *et al.* (1997) developed a time-dependent four dimension framework for measuring project success by which short, medium and long-run objectives of the project are addressed as illustrated in Figure 3.4. The first dimension is “project efficiency”. This dimension assesses the project management process efficiency during the project execution phase. The second dimension is “impact on the customer” which relates to the client and/or the end user of the project product. This dimension assesses whether customer requirements and needs are addressed by the final product of the project. The third is “business and direct success”. This dimension focuses on the changes (if there are any) the project brings to the organisation which initiated it. However, assessing this dimension may need time as business outcomes might need a few years to be realised and evaluated. The fourth dimension, “preparing for the future”, considers the contribution of the

project in preparing the organisation for future opportunities through lessons learned, ideas, innovations and new products (Shenhar *et al.*, 1997). For this reason, this dimension can be addressed few years after the original project is executed.

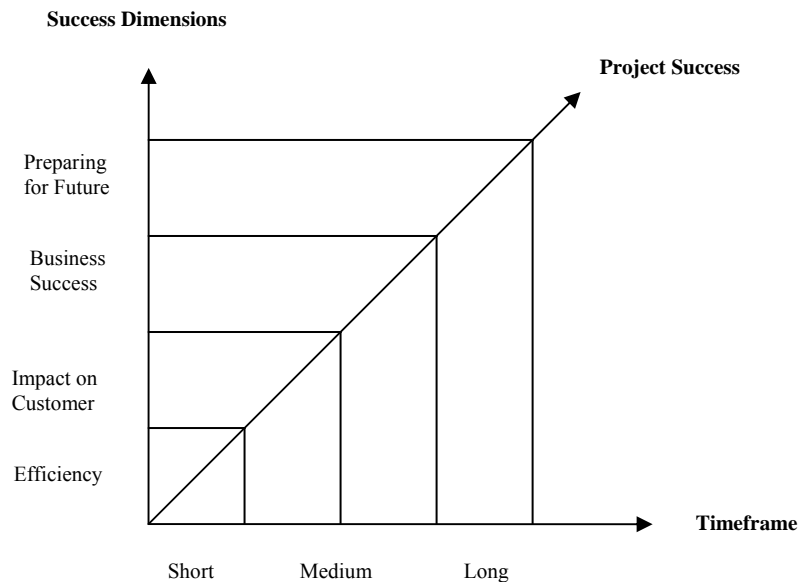


Figure 3.4: Time Frame of Project Success Dimensions (After Shenhar *et al.*, 1997)

The view of Sadeh *et al.* (2000) is that project success in general can be divided into four dimensions in the same way as the time-based framework developed by Shenhar *et al.* (1997). The first dimension of Shenhar *et al.*'s framework is meeting design goals. The second dimension is the benefit to the end user from the finished product. The third dimension considers the business benefits to the project developing organisation gained by the developing organisation as a result of executing the project. The last dimension is the benefit to the sector. The combination of all these dimensions gives the overall assessment of project success.

Even though the discussion about project success presented above focused on projects in general, the general project success criteria can be applied to construction projects as the role of these type of projects is similar to that of general projects in that they produce outputs used to support organisations core business and clients' objectives.

Pinto (2007) pointed out that the concluding judgement of project success does not come from the project organisation, but rather the market. He added that a project will be considered a success as long as it benefits the client who initiated it. And this is why,

in his view, an external criterion reflecting client acceptance is needed to overcome the explicit limitations of the conventional triple constraint (time, cost and quality) assessment process. In addition, Pinto (2007) claimed that it is not sufficient to evaluate a project by looking at its instant success. A project should also be assessed by its commercial success in addition to its ability to create new business and new prospects. A similar view was expressed by Turner (2009) who explained that when a project is carried out, the focus should concentrate on the desired results because it is essential to fulfil the purpose that the project was initiated for and realise certain benefits.

3.5 Success Factors

In addition to using different criteria by which project success can be evaluated, researchers also investigated conditions or circumstances which could critically impact the possibility of achieving project success. These conditions or circumstances are known as critical success factors (CSFs). Lim and Mohamed (1999, p243) defined success factors as *“the set of circumstances, facts, or influences which contribute to the project outcomes”*. Rockart (1979) claimed that the concept of critical success factors was introduced and discussed in the management literature by Daniel (1961) who suggested that the management information system of an organisation should be *‘discriminating’* and *‘selective’* when considering an organisation’s strengths and weaknesses in that it should concentrate on "success factors." The factors which determine organisational success need to tackle three areas (Daniel, 1961). These areas are:

- *Quantitative-financial* (e.g. sales)
- *Quantitative-physical* (e.g. productivity)
- *Non quantitative* (e.g. employee relations)

Daniel described these factors as key tasks that must be carried out exceptionally well for an organisation to be successful. The concept was developed further by Rockart (1979) who defined critical success factors as:

“the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where "things must go right" for the business

to flourish. If results in these areas are not adequate, the organization's efforts for the period will be less than desired. As a result, the critical success factors are areas of activity that should receive constant and careful attention from management. The current status of performance in each area should be continually measured, and that information should be made available."

Since then many research studies have been published in the subject and consequently, lists of critical success factors have been formed to understand how projects, in general, can be successfully carried out. Schultz *et al.* (1987) developed a ten-factor framework that affects project success. Their framework considers two project phases; the strategy phase (the "planning") and the tactical phase (the "doing").

Other attempts include Parfitt and Sanvido (1993) who presented a checklist for predicting the success of construction projects. It included four groups of critical success factors, namely: the facility team, contracts obligations and changes, facility experience, and optimisation information. Parfitt and Sanvido (1993) considered the checklist as a management and planning tool for identifying possible difficulties to inform permits appropriate corrective actions. In addition, Chua *et al.* (1999) tried to identify critical success factors for different project objectives. They developed a hierarchical model for construction project success, where success is affected by different factors related to four project aspects. These aspects included project characteristics, contractual arrangements, project participants, and interactive processes. However, the findings of the study showed that there are different sets of CSFs for different project objectives.

Other researchers examined CSFs by relating them to particular areas. Cheng *et al.* (2000) presented a framework of critical success factors that determine the successful use of partnering in construction projects. Their framework emphasises the impact of contextual characteristics and management skills on partnering success. The CSFs framework comprised of effective communication, conflict resolution, adequate resources, management support, mutual trust, long-term commitment, coordination, and creativity. The level of partnering success is indicated by subjective measures such as

perceived satisfaction of partners' expectations; and objective measures such as cost variation and rejection of work and schedule variation (Cheng *et al.*, 2000).

In fact, there have been many studies, as indicated earlier in this chapter, that produced different lists of CSFs for different purposes and aimed at identifying the ultimate list. The opinion of Belassi and Tukel (1996) is that identifying all possible factors that might affect project success of any type is impossible due the uniqueness of projects, even although they have common characteristics and lifecycles. This makes any developed list of success factors incomplete (Lam *et al.*, 2004). Instead, Belassi and Tukel (1996) introduced a framework that classifies critical success factors into four groups. The first group includes factors related to the project characteristics. The second one includes factors related to the project manager and the team members. The third has factors related to the organisation. And the last one covers factors related to the external environment. Belassi and Tukel (1996) claimed that the four groups of success factors present a comprehensive framework; hence, any particular factor appearing in the project success literature can be classified under one of these groups.

Determining which factors are critical or have influence over project success is a challenging task since several interrelated factors have impacts on the design, construction, and operation phases of a building project (Parfitt and Sanvido, 1993). These inter-relationships among various success factors may have the same importance as the individual factors but the CSFs approach does not provide ways to represent these inter-relationships (Fortune and White, 2006). Moreover, not only is the importance of the various factors for success not equal, but also their priority order changes over the life span of the project which means that various factors could be critical at different stages of the project (Pinto and Slevin, 1988).

3.5 Project Success and its Measurement in Construction

The main business of the construction industry is to produce buildings and infrastructure using projects as vehicles for this production. Consequently, the performance of construction projects has been carried out using two approaches. The first approach focused on the finished product and the second approach focused on the creation of the product as a process (Kagioglou *et al.*, 2001). The first approach, which

considers completing the project on time, within budget and to predetermined specifications as the criteria for project success, has been the predominant approach of measuring the performance of construction projects (Kagioglou *et al.*, 2001). In this approach, the performance of construction projects is judged by using the same criteria used to evaluate the success general projects. These three criteria represented the contractor's perspective of construction project success (Turner, 2009). The opinion of Kagioglou *et al.*, (2001) is that although the three criteria can be considered as an indication of project success or failure, using them exclusively does not show a sufficiently comprehensive view of project performance. Ward *et al.* (1991) claimed that using time, cost and quality to measure project success alone has three limitations. The first is the difficulty of measuring the qualitative aspects of criteria such as quality caused by its subjective nature. The second issue is that the three criteria could be interconnected. This shed light on the way that the process of prioritising these criteria happens. The third limitation is related to the issue of defining the project objectives at a suitable level. Ward *et al.* (1991) concluded that defining success by meeting these criteria or exceeding them only reveals a simple meaning of considering a construction project successful.

Baker and Fisher (1988) explained that success incorporates, in addition to the technical performance of the project output, satisfaction among different key project participants such as clients, project team and end-users. Moreover, Ward *et al.* (1991) suggested that other criteria such as the relationship between project key players, goodwill and trust are required. Such criteria inform the quality of relationship among key project's players which in turn can influence customer satisfaction and affect the success or failure of the project (Bassioni *et al.*, 2004). In addition, Ward *et al.* (1991) also pointed out that a project should be evaluated by all engaged participants to consider whether their objectives have been met or surpassed. However, reaching a consensus among project participants regarding project success is difficult because each has a different perspective (Chan *et al.*, 2002). Furthermore, construction projects involve social responsibility aspects because they will have impacts on every element of society (Lim and Mohamed, 1999). Considering this reality, project success should include the perspective of wider stakeholders. This challenge creates differences in opinions about which stakeholder perspective of project success should be adopted (Lim and Mohamed, 1999). This issue draws the attention to the importance of the project

stakeholders' perception of project success and consequently their role in characterising project success.

The definition of 'stakeholders' is used to embrace whoever has an interest in or is affected by a project. But this definition includes some entities which do not have power to influence the project characterisation or its results (Walker, 2007). Other definitions have further prescription; they consider project stakeholders to comprise only those with the capability and power to inform the project directly (Walker, 2007). Furthermore, Pinto, (2007) pointed out that in some cases, an organisation should pay careful attention to the potential influence that some stakeholders are able to exercise. In some scenarios stakeholders have little power to inform an organisation's activities but they may still need to be considered. However, the most powerful voices often determine what counts as 'good', and therefore what criteria and standards for judgement apply (McNiff *et al.*, 2003).

As discussed in the previous section, one of the main characteristics of construction projects is that there are a number of different parties involving in making the project output happen. Lim and Mohamed (1999) distinguish between two groups of project stakeholders; those who are directly involved in the project like the owner, developer, designer, contractor and subcontractors. For them, project success could be considered as the attainment of a number of pre-determined goals and objectives, which include measures as time, cost, performance, quality and safety. The other stakeholder group comprises those indirectly involved in the project like the end-users and the general public. These stakeholders might not necessarily have the same goals and objectives for the project.

Lim and Mohamed (1999) considered that project success falls into two categories; the macro and micro perspectives. The macro view concentrates on assessing if the original project concept has been achieved. This assessment can only be performed when the project output starts its operational stage. In addition, this judgement is made by the client and to some extent other stakeholders such as the end-users and local community. The macro perspective of project success is accordingly formed in the conceptual and operational phases of projects. The micro view, on the other hand, focuses on specific project achievements. These achievements are usually assessed at the end of a

construction phase by the parties involved in executing the project. Hence, the micro perspective of project success is formed in the construction phase and includes success criteria such as time, cost and quality (Lim and Mohamed, 1999).

Kometa *et al.* (1995) expanded the way project success is evaluated by using a comprehensive framework. Their criteria comprised safety, economy (construction cost), maintenance cost, time and flexibility to users. Kumaraswamy and Thorpe (1996) in the same way proposed a range of criteria for evaluating projects. These included cost, time, quality of workmanship, client and project manager's satisfaction, transfer of technology, friendliness of environment, health and safety.

Chan *et al.* (2002) summarised project success criteria in three main trends. The first trend is called 'meeting objectives' and includes criteria that reflect the client's needs and objectives. The second trend covers criteria that are of 'global approach' which judge project success 'objectively' and 'subjectively' and include tangible and intangible objectives. The third one is the 'beyond project' trend which represents criteria that expand beyond the project lifecycle and covers measures that are timeframe based that expands few years behind the project completion.

3.6 Performance Measurement Frameworks in Construction

General success criteria that were discussed earlier in this chapter are summarised in Table 3.1. In this table, a distinction is made between success criteria and success dimensions. Success criteria are characteristics, features or principles against which project performance is measured and judgments are then made about project success (see Section 3.4). A success dimension, on the other hand, is a set of success criteria that have common attributes that can be used to describe specific aspect of the project performance. A synthesis of different authors' work is presented in Table 3.2

Author	Success dimension	Success criteria
Gaddis (1959)	–	Time, budget and specifications
Ashley <i>et al.</i> (1987)	–	Cost, schedule, quality, safety, and participant satisfaction
Pinto and Slevin (1988)	Projects	Time, cost and performance
	Clients	Use, satisfaction and effectiveness
de Witt (1988)	Project management success	time, cost, and quality
	Project success	Overall objectives of the project
Pinto and Pinto (1991)	Project Task Outcomes	Time, cost, performance and likelihood of usage by clients
	Project Psycho-Social Outcomes	Satisfaction of interpersonal relations with project team members Perceived experience of the project
Parfitt and Sanvido (1993)	–	Technical performance specifications, project mission, satisfaction
Kometa <i>et al.</i> (1995)		Safety, economy (construction cost), whole life cost, time and flexibility to users
Kumaraswamy and Thorpe (1996)		Cost, time, quality of workmanship, client and project manager's satisfaction, transfer of technology, friendliness of environment, health and safety
Shenhar <i>et al.</i> (1997)	Project efficiency	
	Impact on the customer	
	Business and direct success	
	preparing for the future	
Lim and Mohamed (1999)	Micro perspective	
	Macro perspective	
Atkinson (1999)	The delivery stage – the process: doing it right	
	Post delivery stage – the business: getting it right	
	Post delivery stage – the benefits: getting them right	
Sadeh <i>et al.</i> (2000)	Meeting design goals	
	Benefit to the end user	
	Benefit to the developing organisation	
	Benefit to the technological infrastructure	
Chan <i>et al.</i> (2002)	Meeting objectives	
	Global approach	
	Beyond project	
Turner and Muller (2009)	–	End-user satisfaction, supplier satisfaction, team satisfaction, customer satisfaction, other stakeholders' satisfaction, time, cost, quality, meeting user requirements, project achieves its purpose, reoccurring business
Pinto (2007)	Instant success	
	Benefits to the client	
	Commercial success	
	Creating new business and new prospects	

Table 3.1: Project success Dimensions and Criteria

Success dimensions	Success/performance criteria	Success/performance measures
The delivery stage – the process: doing it right <ul style="list-style-type: none"> • Projects • Project management success • Project Task Outcomes • Project Psycho-Social Outcomes • Micro perspective • Meeting objectives 	Project efficiency <ul style="list-style-type: none"> • Instant success • Meeting design goals Impact on the customer	<ul style="list-style-type: none"> • Time • Budget • Quality • Safety • Transfer of technology • Customer satisfaction • Supplier satisfaction • Team satisfaction • Productivity
Post delivery stage <ul style="list-style-type: none"> • Clients • Project success • Macro perspective • Beyond project 	Business success (Commercial success) <ul style="list-style-type: none"> • Benefit to the end user • Benefit to the client Preparing for the future <ul style="list-style-type: none"> • Creating new business and new prospects 	<ul style="list-style-type: none"> • Use (product quality) • Satisfaction • Overall objectives of the project • Whole life cost • Flexibility to users • End-user satisfaction • Customer satisfaction • Reoccurring business

Table 3.2: Synchrony of Project Success Dimensions, Criteria and Measures

The construction industry used measurement frameworks to measure project performance. In this regard, Bassioni *et al.* (2004) pointed out that the use of performance measurement frameworks (such as the European Foundation for Quality Management (EFQM) excellence model, key performance indicators (KPI) and the Balanced Scorecard in UK construction industry are rising in an attempt to improve performance. Examples of using such frameworks have been expressed in the construction management literature and are presented below.

3.6.1 Key Performance Indicators

Nardo *et al.* (2005, p8) defined an indicator as “a quantitative or a qualitative measure derived from a series of observed facts that can reveal relative positions in a given area”. McCabe (2001, p89) stated that key performance indicators “represent the measures of progress in achievement of the critical success factors”. Turner (2009, p52) said that KPIs are “key control parameters which measure progress towards achievement of success criteria”. Another definition was introduced by Berman (2006, p.73) who declared that a key performance indicator is “a measurable variable that is related to a series of process steps whose performance can be managed and delivered against a particular corporate or project objective”. It can be inferred from the definitions that KPIs can be used to measure both success criteria and critical success factors. In addition, KPIs can represent quantitative or qualitative measures or objective

and subjective measures (Chan and Chan, 2004). Within this context, and as a response to the Latham Report (1998), which promoted the need to improve the efficiency and effectiveness of the industry, and the Egan Report (2002) which emphasised the need to set ambitious targets and effectively measure performance against those targets, the Construction Best Practice Program (CBPP) launched UK construction industry KPIs for performance measurement. These KPIs provide information on the scope of performance being achieved in a variety of construction activities. The KPIs are:

1. Client satisfaction – product
2. Client satisfaction – service
3. Defects
4. Predictability – cost
5. Predictability – time
6. Profitability
7. Productivity
8. Safety
9. Construction cost
10. Construction time

The purpose of introducing the construction KPIs was to provide benchmarking indicators for the entire industry so that any construction company could measure its performance relative to a national industry norm. This helped the companies to identify areas for further improvement and development (Kagioglou *et al.*, 2001).

It is worth noting that the CBPP KPIs, on the one hand, have been credited for encouraging construction companies to measure and benchmark their performance, but, on the other hand, have been criticised because they produce information describing past actions which limits an organisation's ability to take pro-active actions. They can, therefore, be termed as lagging indicators (Beatham *et al.*, 2005). Moreover, Kagioglou *et al.* (2001) shed light on their comprehensiveness and their focus on the performance of the construction project rather than the organisational performance. In addition, Kagioglou *et al.* (2001) found that although the KPIs are aimed at identifying areas for improvement as a result of a benchmarking exercise, they do not provide insight into the tools of improving performance and consequently cannot be effectively used for

management decision making. The opinion of Beatham *et al.* (2004) is that construction companies have used the CBPP KPIs as a marketing tool, instead of using them as a means to manage and improve their businesses. Moreover, a growing number of construction companies preferred adopting the Balanced Scorecard and the EFQM (Robinson *et al.*, 2005).

3.6.2 Conceptual Performance Measurement Process Framework (PMPF)

Kagioglou *et al.* (2001) introduced the conceptual Performance Measurement Process Framework (PMPF) that used the balanced scorecard (BSC) pioneered by Kaplan and Norton (1992) to apply advancements in the manufacturing industry into construction. The key objective of the framework was to provide a comprehensive performance management/measurement process framework showing the relationship between measuring and managing performance from a “process” perspective (e.g. input, process and output). Their framework incorporated two additional dimensions in addition to the original four dimensions of the BSC’s two perspectives. The two extra dimensions relate to the construction industry and are the project and supplier dimensions.

One of the PMPF’s features is that it signifies links between performance measures and company objectives derived from strategy. In addition, its process-performance measurement relationship matrix shows areas that need further improvements (Bassioni *et al.*, 2004). Kagioglou *et al.* (2001) found that when measuring the performance of construction projects using the BSC as a template measurement framework, three of the four BSC perspectives can apply:

1. Financial perspective;
2. Internal processes perspective;
3. Customer perspective

Kagioglou *et al.* (2001) argued that the fourth perspective, which deals with organisational learning and continuous improvement, can be challenging due to the fact that participants in construction projects have temporary relationships. This may form an obstacle to the identification and agreement of appropriate methods for measuring and managing performance. Kagioglou *et al.* (2001) indicated that the Performance

Management Process Framework (PMPF) is conceptual in form and lacks validation which means that it cannot be used effectively by construction organisations on its current status because the framework needs empirical evidence to derive its final form (Kagioglou *et al.*, 2001).

3.6.3 An Integrated Business Improvement System (IBIS)

The design of the Integrated Business Improvement System (IBIS) utilised the EFQM Excellence Model. Consequently, the IBIS includes nine criteria similar to the EFQM Excellence Model. Moreover, business objectives are required to be established for all the nine criteria of the model before the measurement process starts. This guarantees a comprehensive assessment of business performance. In addition, The RADAR (results, approach, deployment, assessment, and review) logic of the EFQM model is used to initiate continuous improvement. The IBIS is illustrated in Figure 3.5.

The IBIS system was also designed in such a way that each high-level business objective will be assigned with one or more critical success factors (CSFs) and then a measure will be allocated to each of these CSFs. Hence, using the designed measures would indicate whether the CSFs have been fulfilled or not and therefore whether the related business objective has been achieved or failed (Beatham *et al.*, 2005).

The structure of the IBIS includes three types of performance measures; key performance indicators (KPIs), key performance outcomes (KPOs) and perception measures (Beatham *et al.*, 2005). In order to understand the distinction between these three types of measures, it is necessary to explore the meaning of two performance related terms: lagging measures and leading measures. The opinion of Beatham *et al.*, (2004, p106) is that lagging measures can be described by referring to their characteristics:

- *They are used to assess completed performance results*
- *They do not offer the opportunity to change performance or alter the result of associated performance*
- *They are used only as a historical review.*

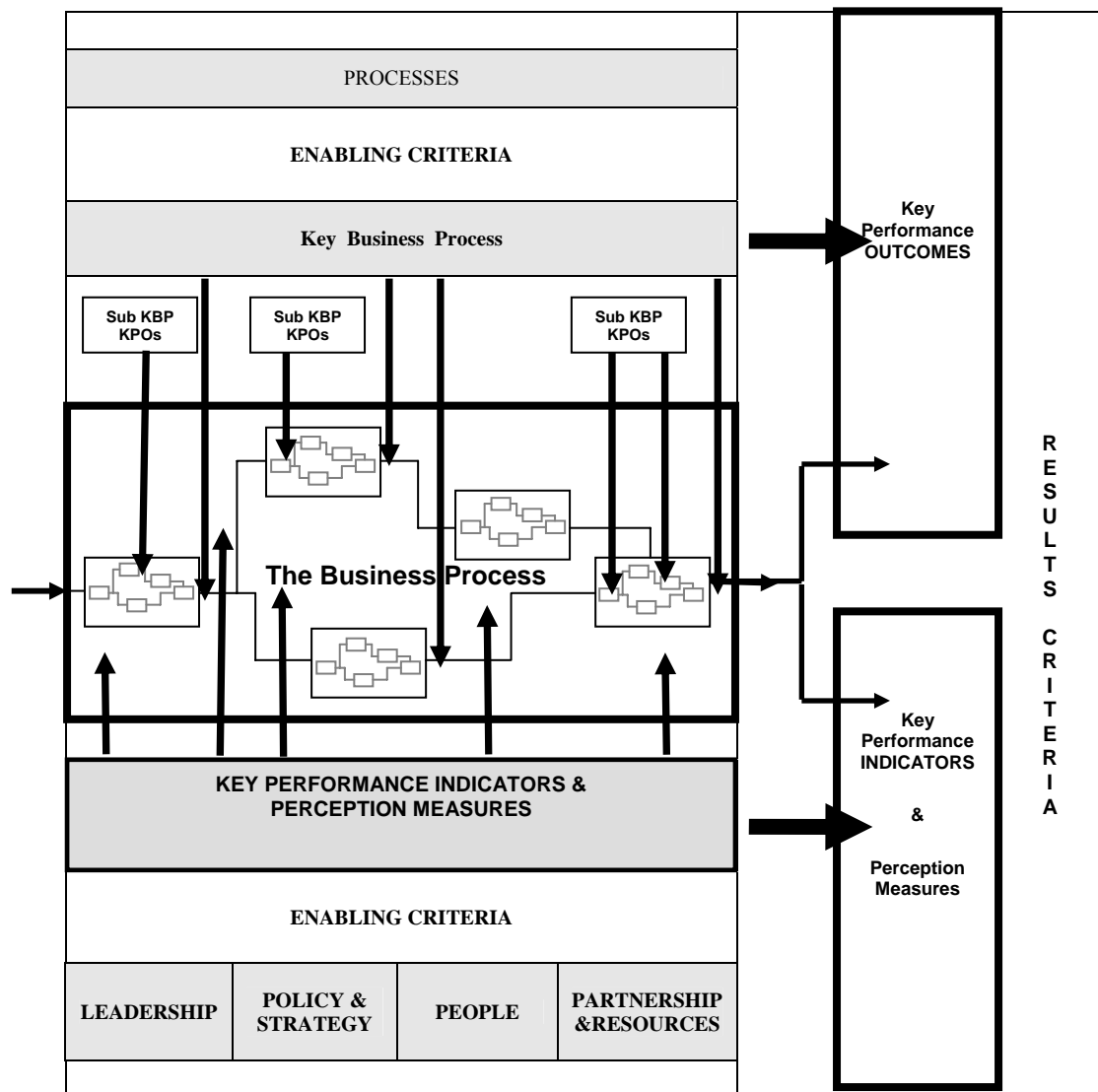


Figure 3.5: The Integrated Business Improvement System

(After from Beatham *et al.*, 2004)

On the other hand, Beatham *et al.*, (2004, p106) defined leading measures by saying that:

“They are measures of performance whose results are used either to predict future performance of the activity being measured, and present the opportunity to change practice accordingly, or to enable future decisions to be made on future associated activities based on the outcome of previous activities.”

The opinion of Andersen (2007) is that ‘lagging indicators’ are measures that record documented results. He further explained that they are used after a business process is finished at a stage when the product/service it is aimed to achieve is complete. In a

similar way, Hale (2003) suggested that the use of lagging indicators is linked to generating business results. Therefore, Hale asserted that achievements should be considered as lagging indicators; they are the outcomes of a finished process that involved human and non-human resources. In addition, they show if an organisation (or a project) is successful in achieving the outcomes they intended to deliver.

Beatham *et al.*, (2004, 106) considered that KPIs “*are measures that are indicative of performance of associated processes.*” Therefore, they are used as leading indicators, and because they can signal an early warning, they offer the possibility of modifying a process and to make suitable decisions. Consequently, this type of measure can be considered a leading measure (Beatham *et al.*, 2004).

Similarly, Beatham *et al.*, (2004, 107) suggested that KPOs “*are results of a completed action or process. They therefore do not offer the opportunity to change.*” Consequently, this type of measure can be considered a lagging measures.

Perception measures are the type of measure that can be used frequently at different phases of a project to provide individual judgement about some performance aspects such as “satisfaction” measures. Therefore, they can be considered as leading or lagging indicators Beatham *et al.*, (2004).

3.6.4 A business performance measurement framework in construction

Performance measurement in construction was perceived to address two functions. The first focuses on assessing general business health of organisations. The second focuses on assessing organisations’ strategic performance (Bassioni *et al.*, 2005). The former perceived function of performance measurement involves obtaining a general and comprehensive examination of the way construction organisations perform in various aspects of the business. The performance of this function can be appropriately assessed by adopting EFQM Excellence Model which provides a wide and general view of performance. The other perceived function of performance measurement pays attention to a fewer number of business areas that are linked to an organisation’s strategic objectives. This function is best assessed by using the balanced scorecard (BSC) (Bassioni *et al.*, 2005).

Bassioni *et al.* (2005) suggested that organisations should have a measurement system that performs both functions. A comprehensive conceptual framework for measuring business performance in the construction industry was, therefore, developed based on the principles of existing frameworks such as the Balanced Scorecard (Kaplan and Norton, 1992), and the EFQM Models. Such models were used since they are widely known and well established in practice in addition to academia, therefore, providing initial validity of the developed framework (Bassioni *et al.*, 2005). The development process began by incorporating the Balanced Scorecard four perspectives and the EFQM criteria, into a comprehensive collection of performance dimensions (Bassioni *et al.*, 2005).

The aim was to extract the embedded logic from the original frameworks to form a causal map instead of a set of performance dimensions. The resulting framework consisted of two parts; the first relates to performance driving factors and the second relates to performance results factors. The performance driving factors comprised leadership; customer and other stakeholder focus; strategic management; information and analysis; people management; partnerships and suppliers management; resources management; intellectual capital management; risk management; work culture; and process management. The performance results factors comprised: people, partnership and supplier results; project results, customer and society results; and organizational business results (Bassioni *et al.*, 2005).

Bassioni *et al.*'s research showed that the relationships between the performance dimensions in their framework found complicated, and not necessarily causal. Moreover, their study also showed that the suggested framework is more suitable for measuring general business health, since it has a comprehensive nature and include a broad range of performance factors, rather than assessing the strategic performance, which needs taking particular attention to areas of strategic importance (Bassioni *et al.*, 2005).

In conclusion, Bassioni *et al.* (2005) explained that the detailed implementation of the conceptual framework needed more investigation. They also concluded that scoring techniques need to be developed. Moreover, the framework didn't demonstrate the

relationships between different components of performance factors which, consequently, require further examination (Bassioni *et al.*, 2005).

3.6.5 The Project Excellence Model

The concept of the EFQM Excellence Model which shows causality between performance drivers and performance results has been adopted by Westerveld (2003) who developed a Project Excellence Model linking success criteria and critical success factors for projects. Figure 3.6 shows the Project Excellence Model. The developed framework comprises of six result aspects reflecting project success criteria and six organisational aspects reflecting critical success factors.

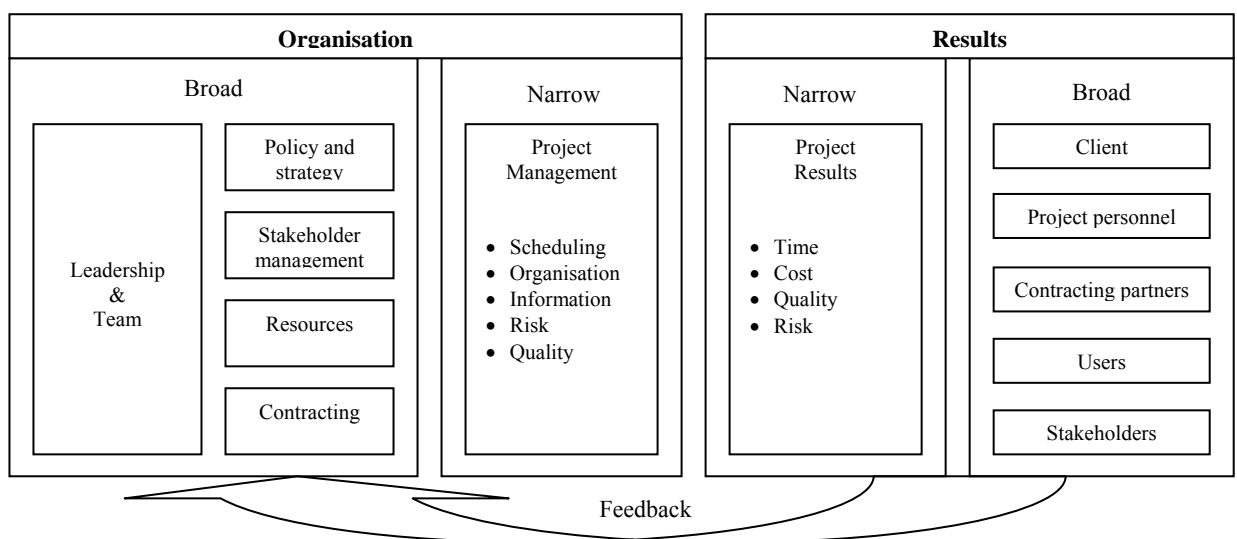


Figure 3.6: The Project Excellence Model (Adopted from Westerveld, 2003)

Westerveld (2003) suggested that the successful completion of projects requires attention to be paid, by the temporarily formed project organisation, to result areas (project success criteria) and to organisational aspects (critical success factors).

This model illustrates that the good project results upon completion depend on a set of factors controlled by the project organisation. In addition, the Project Excellence Model recognises the distinction between project management success and project success presented by deWitt (1988), by taking into consideration the broader success dimensions.

3.7 Conclusion

The conception of project success has developed over the years and so have its criteria of success. Studies showed also that project success means different things to different people and therefore there was a constant transformation in perceiving success.

This chapter showed that early studies focused on finishing the project to its planned schedule, within budget, and in accordance to agreed specifications when considering whether a project is a success or failure. However, determining project success has been reformed by the evolution of a number of relevant concepts that shaped project success criteria and success factors. These concepts include the following:

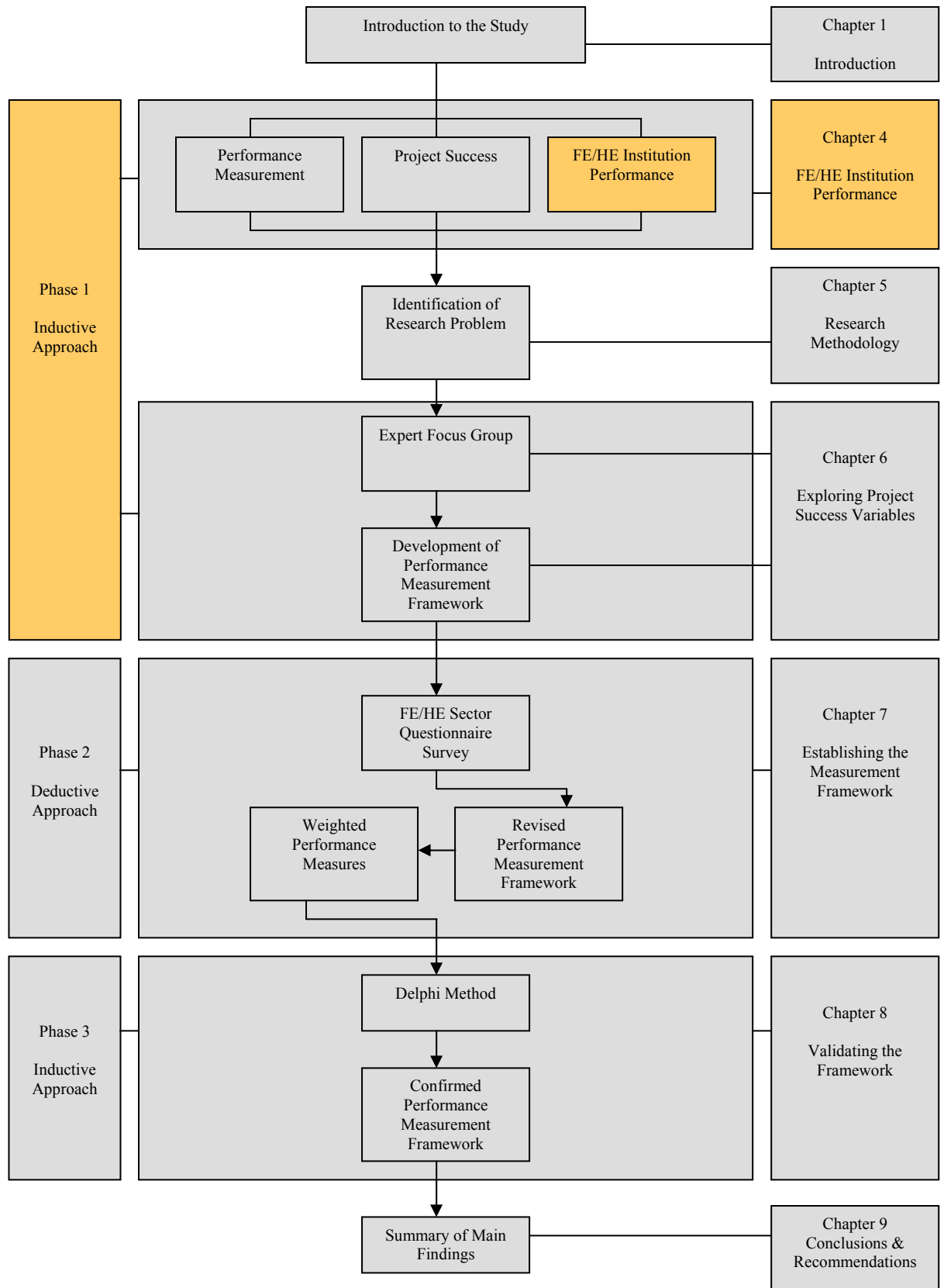
- The priority of the project in an organisation's agenda may determine project success.
- The importance of the client (or the end-user) perspective.
- Distinction between project management success and project success.
- Extending the concept of project success to cover intangible perspectives of the implementation "process" such as psych-social outcomes.
- Distinction between "project task outcomes" and "project Psycho-Social outcomes".
- Distinction between strategically managed projects, and operationally managed projects.
- The link between the creation of the investment assets (the "project") and the consequent operation of those assets to attain business benefits.
- Distinction between the "project" macro and micro perspectives.
- Focus on time-based criteria that go beyond the conventional project lifecycle into achieving business success.
- The place of the "project" within the client's core business.

Researchers, in addition to using different criteria as an approach to assess project success, have also investigated factors affecting project success. Various lists of critical success factors were formed to understand how projects can be successfully carried out. However, it is important to note that identifying all possible factors that affect project

success is a difficult, if not impossible, task due to the many different types of projects, even though they have common stages to follow.

This chapter also showed that definitions of project success indicated a prominent link with the notion of achievement. This achievement can be represented in different terms such as technical, financial, social, and professional issues. Hence, in the construction industry - the sector that has been always criticised for poor performance and lacking initiatives to innovation - organisations attempted to apply best practices from business performance measurement such as the balanced scorecard and other quality based frameworks such as the EFQM Excellence Model in addition to key performance indicators (KPI). This trend sought to improve the industry's performance at both organisational and project levels. However, the review showed that measuring projects in construction did not explicitly include elements that express the long term success of the business for which the construction project is undertaken. This view can be provided by adopting the wider project success concept that appears in the literature, even the construction management literature, in which the definition of success is expanded beyond the delivered construction project. This necessitates exploring the nature of the business the construction product must facilitate and how that business can be successful by shedding light on the way in which business performance is measured. This issue will be the subject of the next chapter which will explore the nature of further and higher education (FE/HE) and the way this type of educational service is measured.

Chapter 4: Further and Higher Education Institution Performance



Chapter 4: Further and Higher Education Institution Performance

4.1 Introduction

The previous chapters reviewed and discussed the concept of performance measurement and the way by which organisational performance can be measured on different performance measurement frameworks. In addition, the concept of project success was explored and key performance criteria for determining it were reviewed and discussed. It was found that a major limitation to performance measurement is that the criteria used to measure the performance of construction projects do not sufficiently consider the business that the project output is facilitating.

This study seeks to develop a performance measurement framework for the construction projects that facilitate further and higher education (FE/HE) co-location. Exploring the nature of further and higher education and how FE/HE institutions measure their performance is a necessary step in framework development. This review will identify key performance areas that a measurement framework should include to ensure co-location project success.

This chapter reviews the nature of further and higher education (FE/HE) to characterise this sector. It then examines quality issues in further and higher education and discusses approaches to measuring the performance of education institutions.

4.2 The structure of non-compulsory education

Tertiary education is a sophisticated mechanism that transforms various inputs, such as students' time, teachers' time, consumable materials, equipment and buildings, into 'knowledge products' (Ashworth and Harvey, 1994). This transformation process is highly value adding as these knowledge products are often in the form of qualified people and intellectual property with the potential to significantly benefit society by creating new knowledge and providing training and development (Ashworth and Harvey, 1994; Altbach, 1998). Post-secondary education in Scotland consists of two main types: further and higher education.

4.2.1 Nature of further education

Further Education (FE) is for students who are 16 years old or over. Further education is provided by further education institutions which offer courses that often lead to the award of National Qualifications (NQs), Higher National Certificates (HNCs) and Higher National Diplomas (HNDs), National Vocational Qualifications (NVQs), Scottish Vocational Qualifications (SVQs) and specialist courses (Thomson, 2003). Originally, further education focused on serving the industrialisation process by providing technical education on a part time basis for technicians and craftspeople. The sector expanded and developed during the last century to offer vocational education and training generally on a day release basis (Huddleston and Unwin, 2007).

The further education sector has a great impact as it educates and trains large numbers of students (Robson, 1998). Lumby (2001) pointed out that even though further education has a presence nearly everywhere nationwide and has a connection with communities, its role is still vague in the public eye. Huddleston and Unwin (2007) agreed that the sector has been many years off the educational radar, unlike universities and schools which have succeeded in catching the attention of the government and the general public to highlight the value of their activities. FE colleges have recently gained attention in terms of public policy, in recognition of their role in developing students' thinking and skills. FE colleges have also been recognised for offering places for a large number of students who left schools either because schools cannot include them or because those schools are reluctant to include them (Huddleston and Unwin, 2007). Further education, therefore, offers school leavers the opportunity to progress in a college environment (Huddleston and Unwin, 2007).

Students today in further education range in age from 16 years old to those in their eighties. The curriculum offered by the sector lead to qualifications which are exclusively provided by colleges in addition to qualifications offered in parallel in schools and the higher education sector (Lumby, 2001).

Huddleston and Unwin (2007) commented that further education institutions have worked hard to inclusively offer non-selective education for all students who wanted to take advantage of extended education or vocational training. In many FE institutions, this provision covered various subjects ranging from basic vocational education to fully

accredited programmes (Lumby, 2001). FE institutions are recognised for broadening access to more students, encouraging social inclusion and promoting lifelong learning (Gallacher, 2006).

4.2.2 Nature of higher education

Higher Education (HE) institutions provide courses that are at HNC/HND levels or above (Thomson, 2003). The main functions of higher education are (HEFCE, 2009):

- to enable people to develop their capabilities and fulfil their potential, on personal or at work basis;
- to advance knowledge and understanding through teaching and research; and
- to contribute to an economically successful and culturally diverse nation.

School leavers can enter higher education from S5 or S6 when they are 16 years old or over. The number of students in secondary schools who prefer to enter higher education (HE) is on the rise in that the percentage of the students pursuing higher education qualifications has increased to exceed 50% in Scotland (Bryce and Humes, 2003). The nature of Scottish higher education has changed considerably since the last decade of the last century as the number of students pursuing degrees at higher education institutions has increased dramatically and almost doubled in the period between 1990 and 2000 (Caldwell, 2003). In addition, the age of students has changed too so that undergraduate degrees are now studied not only by school leavers who are studying full-time, but also by the large numbers of mature students (older than 21 on entry) and other part-time students. Moreover, higher education has become part of ‘lifelong learning’, which expands to cover an adult’s working life and occasionally continues into retirement (HEFCE, 2009).

4.5 Links between further and higher education

Many colleges are becoming involved in providing higher education by partnering with universities. In Scotland, 20% of higher education students are actually based in further education colleges (Morgan-Klein, 2003a). This form of providing higher education has improved the status of further education institutions (Gallacher, 2006). In addition, progression of further education students into higher education reflects the collaboration

between FE and HE institutions. However, this progression relies on the quality of the links between education institutions in both sectors (Morgan-Klein, 2003b). In addition, progression often involves articulation arrangements which allow students to progress from a further education institution to a specified higher education institution (Alexander *et al.*, 1995). This pattern has been dominantly represented by students progressing from HNC or HND courses in further education institutions into year two or year three respectively of degree programmes at universities (Thomson, 2003). Other links can take the form of franchising arrangements which include delivering a university's courses through a further education institution and validated programmes in which an HE institution accredits programmes offered by an FE institution (Alexander *et al.*, 1995).

Most entrants to tertiary education entered the further education rather than the higher education sector (Morgan-Klein, 2003a). In Scotland 52% of entrants to higher education in academic year 2000/2001 started their studies in further education colleges (Morgan-Klein, 2003b). Therefore, the further education sector has grown in significance in that it is now considered an introduction to tertiary education. It becomes more accessible and allows students to progress to degree programmes in universities (Morgan-Klein, 2003b). Moreover, further education institutions have been constantly more successful than higher education institutions in attracting students indicating greater accessibility to their qualifications as opposed to degree level study (Morgan-Klein, 2003b).

4.6 Quality of education institutions

Growing international competition among educational institutions has led many organisations to stress the importance of service quality to marketing and business strategy (Abdullah, 2006). Arguably, higher education service providers must compete commercially in response to the emergence of global education markets and cutback in government funding (Abdullah, 2006). Consequently, tertiary education has to be concerned with the likely resulting challenges of quality of education (Brennan and Shah, 2000).

Improving quality is seen as essential if education services are to meet the requirements of students and society (Redmond *et al.*, 2008). According to Redmond *et al.*, what distinguishes education from other services are two features. The first is that education can be considered a “pure service”. According to Hansen *et al.* (2007), a pure service does not use raw materials nor does it provide a tangible product to customers. The quality of the education service is determined by the responsiveness, dialogue and relationship that develop between academic staff and student as well as the effectiveness of teaching methods (Evans and Lindsay, 2010). Quality in this type of service is further associated with technical factors such as the provider’s experience in delivering the service (O'Shaughnessy, 1995, p.342)

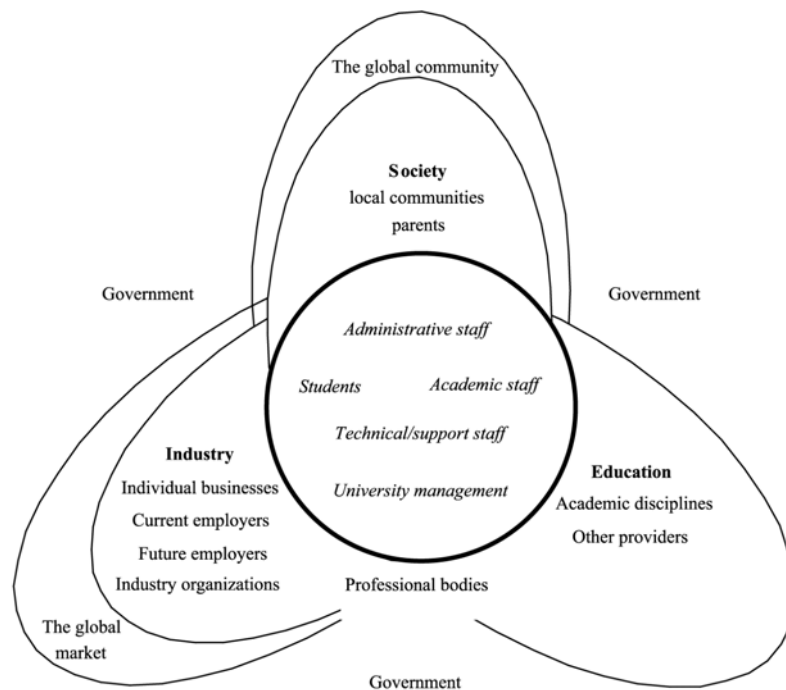


Figure 4.1: Interested parties in FE/HE (After Houston, 2008)

The second distinctive feature of education services is the diversity of its beneficiaries. Although students are the primary beneficiaries of the service, others also benefit from it. Parents, potential employers and society also have an interest in the level, appropriateness and suitability of education for their own needs too (Redmond *et al.*, 2008). Houston (2008) structured interested parties in the post-secondary education into three classifications illustrated in Figure 4.1:

- Those with an economic perspective such as potential employers and industry groups.
- Those with a societal perspective such as families of current and perspective students and community organisations.
- Those with an educational perspective such as academic disciplines and other education providers.

Houston (2008) added that, for institutions which depend on public funds, the government, which is a key financial supporter of higher education, is considered a crucial stakeholder. In addition, those inside the institution, such as university management, administrative staff, academic staff and students, who try to adapt and respond to the range of external expectations, are also vital stakeholders. Therefore, the views of these stakeholders are significant in determining successful collaborating initiatives incorporating other educational institutions.

4.7 Challenges of FE/HE

The further education sector has steadily grown as successive governments have shown clear commitment to vocational education and lifelong learning (Thomson, 2003). However, governments have been reluctant to financially support the required expansion in the FE sector but still demand good quality education and training services (Lumby, 2001). Higher education, on the other hand, has grown in student and staff numbers (Brennan and Shah, 2000). This was coupled by increase in the number of HE institutions (Caldwell, 2003). Those expansions have increased costs and placed higher education in the spotlight. Students, their parents, relatives and future employers are more concerned about the role of higher education in helping students to secure employment when they graduate by ensuring they can do these jobs properly. Other interests relate to the costs involved, whether borne by the government or by the students (Brennan and Shah, 2000).

Despite the increases in student numbers, cuts in financial resources have caused many institutions to face problems related to their educational environment particularly the physical assets that support the educational process (Amaratunga and Baldry, 1999).

Buildings are important functional and economic resources (Ruben, 2003). They are expensive to run, maintain and adjust, and consequently they need to be managed effectively (Douglas, 2006). However, buildings have always been subject to constant change. The opinion of Douglas (2006) is that change has been greatly facilitated and accelerated by technological aspects such as advances in building materials and services and the growth of information technologies. Douglas (2006) added that the speed of change in buildings is likely to rise and that, in turn, will increase the need to adopt more economic use of the space of higher education buildings so they can be used more efficiently.

Within an education building context, Amaratunga and Baldry (1998) argued that technologies should be increasingly used in teaching and research spaces. Other changes are imposed by escalating costs and increasing numbers of people interested in further and higher education (Brennan and Shah, 2000). In response, education institutions need to increase efficiency of their buildings management and are encountering escalating running costs when trying to meet the growing demands of students for quality and value for money (Amaratunga and Baldry, 1998). These challenges have made further and higher education institutions realise the need for more economic use of their spaces, services and facilities while also meeting the challenges of education quality. Douglas (2006) argued that there is a direct connection between the quality of the work space and the effect of that work space on the performance of its occupiers. A study published by CABE (2005) provided evidence of the link between the functions and facilities of education buildings and the recruitment, retention and performance of both the staff and students of higher education institutions.

In response to these changes, the Scottish Executive (2004, p6) policy suggested that *“collaboration between institutions, shared support services, new approaches to estates management and development, better procurement and pooling of research capacity”* will ensure excellence and value for public money. Such collaborations can take the form of co-locating educational operations on a shared site. This approach is currently considered an effective, efficient and strategic solution for enhancing education infrastructure in particular location. It can also bring significant financial, curricular, and structural advantages not achievable through the occupation of separate estates.

4.8 Co-location

The Oxford Dictionary defines co-location as “*the act of placing multiple (sometimes related) entities within a single location*”. This means placing two or more groups (or organisations) together to share one place. In the education sector, co-locating further and higher institutions refers to placing two or more institutions on a single campus. This could take the form of sharing buildings, or sharing facilities and services through collaboration between institutions.

According to Linden (2010), organisations use co-location to enhance information sharing and trust, to produce innovative schemes and to improve service provision. One of the major benefits of the co-location model, apart from potential financial savings, can be inferred from Goodwin (2009). He noted that co-location creates spatial conditions that promote spontaneous interactions between people who occupy the same building. This mechanism is particularly important in the education sector because having two or more FE/HE institutions can be a significant catalyst for enhancing collaboration and academic articulation. Moreover, this mechanism - a co-location atmosphere - could create a new culture based on the traditions, values and the way of doing work at each participating institutions.

In co-locating educational institutions, each institution will continue to have its own autonomy but some facilities and services such as learning resource centres, catering and social areas will be shared. In addition to the pre-existing educational provision, institutions will have the opportunity to offer shared curricula and students will have access to a wider range of courses in the same location. Moreover, students will benefit from facilities and services on a scale beyond the ability of just one institution.

4.9 Performance Measurement of Education Institutions

As mentioned above, the co-location model is believed by Scottish Government to bring several advantages and benefits to the collaborating educational institutions. Interested stakeholders such as FE/HE institutions, government and funding bodies will be concerned about realising those benefits and attaining best value for public money. To provide ‘value for money’, education institutions need to understand how the interaction of students, staff, spaces and services impacts the achievement of institutional goals of

providing quality education. To ensure that institutions are delivering the required educational services while meeting the expectations of stakeholders, the performance of educational institutions must be assessed. This requires more advanced assessment methods of performance than the simple use of quantitative measures or entirely aesthetic, qualitative judgements (Amaratunga and Baldry, 1999). Measuring the performance of buildings and facilities of education institutions is required to inform better planning and design of education properties, improved resource allocation and could lead to potential savings (Amaratunga and Baldry, 2000). It also gives education institutions the opportunity to compare their performance against other institutions, so that areas for improvement can be identified to enhance the way institutions take decisions about the best possible ways for offering buildings that support teaching, learning and research activities. In conclusion, reaching the full potential of a particular initiative would be difficult to achieve without measuring its performance properly (Neely, 2007).

Existing approaches to measuring the performance of education institutions use performance measures related mainly to financial resources, teaching and research income and expenditure (Williams, 2003). However, those performance measures have been criticised by Ruben (2003) who claimed that they:

- are simple because they can be easily collected and expressed in numbers;
- are backward looking;
- cannot provide warnings to institutions to prepare for possible challenges; and
- do not focus on critical qualitative dimensions that are difficult to quantify.

Ruben (2003) further suggested that there is a need for performance measures that capture:

- an institution's contribution to its academic outcomes;
- the extent to which student, academic and non-academic staff needs and expectations are being met;
- workplace climate including the physical environment represented by the institution's estates and facilities; and
- workforce satisfaction.

The literature showed that the focus moved to centre on broader issues concerning the quality of educational services. Within this context, Cheng and Tam (1997) suggested that education quality is defined using a framework of seven dimensions (Table 4.1).

	Conception of education quality	Indicators/key areas for quality evaluation
Goal and specification dimension	Achievement of stated institutional goals and conformance to given specifications.	Institutional objectives, standards, and specifications listed in the programme plans, e.g. academic achievements, attendance rate, dropout rate, etc.
Resource-input dimension	Achievement of needed quality resources and inputs for the institution.	Resources procured for institutional functioning, e.g. quality of student intake, facilities, financial support, etc.
Process dimension	Smooth internal process and fruitful learning experiences.	Leadership, participation, social interactions, classroom climate, learning activities and experiences, etc.
Satisfaction dimension	Satisfaction of all powerful constituencies.	Satisfaction of education authorities, management board, administrators, teachers, parents, students, etc.
Legitimacy dimension	Achievement of the institution's legitimate position and reputation.	Public relations, marketing, public image, reputation, status in the community, evidence of accountability, etc.
Absence of problems dimension	Absence of problems and troubles in the institution.	Absence of conflicts, dysfunctions, difficulties, defects, weaknesses, troubles, etc.
Organisational learning dimension	Adaptation to environmental changes and internal and internal When the environmental process monitoring, programme barriers Continuous improvement.	Awareness of external needs and changes, internal process monitoring, programme evaluation, development planning, staff development, etc.

Table 4.1: Models of Education Quality (After Cheng and Tam, 1997)

In addition, Owlia and Aspinwall (1996) proposed a conceptual framework offering sets of principles for the measurement and improvement of quality in higher education. The researchers applied different quality dimensions adopted in non-academic fields into the education sector in addition to quality factors specified to higher education environment. The idea of adopting best practices from other sectors has been used in the work of Osseo-Asare *et al.* (2002) who developed an assessment tool using the criteria of the European Foundation for Quality Management (EFQM) to examine the quality of UK higher education. They established that “leadership”, “people satisfaction” and “people management” are critical aspects of the EFQM framework that need improvement in the education sector as addressing them will create and support activities, initiatives and resources that enhance educational performance.

Chen *et al.* (2006) used the Balanced Scorecard (BSC) as a strategic management tool to evaluate the performance of higher education institutions. Their study found that HE institutions have the potential to learn from other industries such as the services industries. They claimed that education institutions can achieve their strategic themes that are based on the four perspectives of the BSC (financial perspective, customer perspective internal process perspective and innovation and learning perspective) by setting specific and effective strategic targets and continuously measuring them by establishing suitable performance measures.

Amaratunga and Baldry (2000) developed a measurement framework using the BSC to assess the performance of facilities management in higher education institutions. Their study was based on the four perspectives of the BSC and the internal cause and effect relationships between these perspectives. They approached the subject from a broad strategic viewpoint and the main focus was on the customer perspective. They concluded that the BSC has influence in three main categories in facilities and building management: communication and teamwork, commitment and feedback, and learning. In addition to frameworks developed by researchers in the field of educational institutions performance, industry practitioners have also proposed measurement frameworks such as the one produced by McKinnon *et al.* (2000) as a practical and valid benchmarking guidance for educational institutions. Table 4.2 shows the performance criteria as presented in the report of McKinnon *et al.* (2000) and brief descriptions of them.

The list of criteria developed by McKinnon *et al.* (2000) is comprehensive and encompasses both educational quality performance and the performance of educational property performance. This gives a better insight into the actual performance of educational institutions than frameworks based on academic quality or property and facility performance alone. However, this framework does not show if the different performance indicators can be integrated, a problem that was cited in the work of researchers in the field of performance measurement including Leinonen (2001) and Bassioni *et al.*, (2004).

Performance criteria	Description
Governance, planning and management	Leadership, governance, planning and management reflect the emphasis in a modern university for making best use of resources.
External impact	Reputation and recognition among stakeholders such as prospective students, parents, employers locally and nationally, and local and national media.
Finance and physical infrastructure	Income sources, management of expenditure patterns, expenditure controls, management of debts and investments, requirements for liquid reserves, risk management and management of physical assets.
Learning and teaching	Planning for learning and teaching, the learning environment provided for students, teaching quality, quality assurance measures, and student outcomes, student progress, satisfaction, and employability.
Student support	The extent and efficiency of student administrative services.
Research	Improvements in research management planning, the organisation of research, and research outcomes.
Library and information services	The contribution made by library and information services to the quality, timeliness, and cost effectiveness of the provision and retrieval of the most relevant teaching and research information
Internationalisation	Activities contributing to a culture of internationalisation. Strategies, activities and, particularly, outcomes, are likely to assist in the internationalisation of a university.

Table 4.2: Benchmarking criteria of educational institutions

(After McKinnon *et al.*, 2000)

Another performance measurement framework was developed by the Committee of University Chairs (CUC). This framework was based on studying the experience of nine higher education institutions in designing and applying measures to assess their performance. The study proposed ten key performance indicators in total. Those indicators were divided into two parts (Table 4.3). The first part included two criteria known as “Super KPIs” focusing on key strategic institutional facets (CUC, 2006). The other part comprised eight key performance indicators highlighting main areas of institutional performance operation which reflect institutional health (CUC, 2006). The proposed framework is similar to the one developed by McKinnon *et al.* (2000) in terms of focus and limitations. However, it shows emphasis on exchanging and transferring of knowledge with surrounding communities and other interested parties. This aspect of performance is considered a strength of the framework as its use will enhance an

educational institution's image and support its position locally and among other competing institutions.

Summary indicators ("super KPIs")
Institutional sustainability
Academic profile and market position
Indicators of institutional health
The student experience and teaching and learning
Research
Knowledge Transfer and relationships
Financial health
Estates and infrastructure
Staff and Human Resource Development
Governance, leadership and management
Institutional projects

Table 4.3: CUC Key performance indicators (After CUC, 2006)

Owlia and Aspinwall (1996)	Cheng and Tam (1997)	McKinnon <i>et al.</i> , 2000	Ruben (2003)	CUC (2006)	Chen <i>et al.</i> (2006)	Synthesised framework
		Finance and physical infrastructure		Financial health Estates and infrastructure Institutional sustainability	Income Asset usage HR cost	Financial Financial
Reliability Content Attitude	Absence of problem Satisfaction	Student support Library and information services	Workplace satisfaction	Student experience and teaching and learning	Customer satisfaction	Customer Customer
Delivery Tangibles	Resource-input Goal and specification	Learning and teaching Research	Teaching and learning Research Administration and operations	Research	High quality service process (administration) Teaching facilities Teaching quality	Process Process
Competence	Organisational learning needs	Governance, planning and management		Governance, leadership and management Staff and Human Resource Development Knowledge Transfer and relationships	Promote information technology application Staff quality Staff administration ability	Learning and growth Learning and growth
	Legitimacy	External impact Internationalisation	Public service/outreach	Institutional projects Academic profile and market position	School image	External impact

Table 4.4: Grouping educational institutions performance dimensions and criteria

Performance dimension	Performance criteria
Financial and estates and infrastructure	Income
	HR cost
	Asset usage
Customer	Student satisfaction
	Absence of problem
	Library and information services
Process	High quality service process (administration)
	Teaching facilities
	Teaching quality
	Resource-input
	Administration and operations
Learning and growth	Promote information technology
	Staff quality
	Staff and Human Resource Development
	Knowledge Transfer and relationships
	Governance, planning and management
External impact	School image
	Public service/outreach

Table 4.5: Synthesised performance measurement framework

The framework presented in Table 4.4 was developed by synthesising the education institution performance measurement frameworks reviewed above. Existing frameworks were largely found to address similar performance criteria. Criteria missing from one or more frameworks (such as the financial perspective in Owlia and Aspinwall 1996, Cheng and Tam, 1997 and Ruben, 2003) were present in other frameworks (such as Chen *et al.*, 2006). The synthesised framework comprises five performance dimensions (Table 4.5). Note that the majority of the dimensions in the suggested framework are derived from the framework presented by Chen *et al.* (2006) who developed theirs based on the balanced scorecard (BSC) because of its comprehensiveness. In addition, each performance dimension has a number of corresponding performance criteria.

The suggested measurement framework assesses performance dimensions and criteria that reflect institutional core business. This framework and the framework developed in last chapter (Table 3.2), which reflects generic project performance dimensions and criteria, will inform the development of an overall conceptual framework. The conceptual framework will be of general use for education construction projects. Its applicability to FE/HE co-location projects facilitated by construction projects will be explored further by conducting a focus group workshop. This development of the overall conceptual framework is presented and discussed in Chapter 6.

4.10 Framework Development

This study seeks to develop a comprehensive performance measurement framework for use by educational institutions that are undertaking projects to co-locate their campuses. Achieving this goal necessitates: identifying what constitutes successful projects; investigating success dimensions, criteria and measures; and reviewing and examining performance measurement frameworks. Reviewing literature on the subject of general project success and construction project success has revealed many lists of success dimensions and success criteria. Chapter 3 discussed the importance of understanding the nature of the delivered business when considering construction project success as meeting clients' conceived business objectives. This chapter explained the nature of the further and higher education sectors and examined the performance criteria used by their institutions to measure the performance of tertiary educational institutions. Formation of the conceptual framework builds on these insights to integrate success dimensions and criteria of construction projects developed in Chapter 3 (Table 3.2) and the performance dimensions and criteria of further and higher educational institutions developed in this chapter (Table 4.5).

The development of the overall conceptual framework is based on the idea that overall business performance has two major perspectives; performance drivers and performance results. This idea was expressed in the EFQM Excellence Model (2007) and by Fitzgerald *et al.* (1991)'s Results and Determinants model. The concept implicitly explains the causal relationship between the two performance perspectives in that good results are achieved by focusing on enablers (or determinants). The conceptual framework also adopts Atkinson's framework (1999) which divided project success into three dimensions based on two project stages; delivery stage and post-delivery stage. The delivery stage has one success dimension related to project efficiency. The post-delivery stage has two success dimensions related to the delivered product, the business it is supporting, and the benefits to customers and end-users of a business. Literature showed that the project success has been looked at from two viewpoints expressed by de Wit (1988) as project management success and project success, alternatively explained as macro and micro viewpoints by Lim and Mohamed (1999). The work of these authors, as explained in Chapter 3, showed that the first viewpoint focuses on the project delivery stage through which the construction project is executed. The other

viewpoint focuses on the post-delivery stage that continues beyond conventional construction project conclusion shortly after handover into the constructed facility lifecycle.

The development of the conceptual framework in this study also adopts principles identified as strengths of performance measurement frameworks (recall Chapter 2). Therefore the conceptual measurement framework needs to adopt a hierarchal structure which expresses integration across different business functions of an organisation in a similar manner to the Du Pont Pyramid of Financial Ratios. It also should reflect an organisation's multidimensional environment so that it can help them their competitive advantage by extending performance measurement to include measures that can express organisational focus on customer satisfaction and growth (Keegan *et al.*, 1989). The Performance Pyramid (Lynch and Cross, 1991) emphasised that frameworks should express linkages between strategy and operations by disseminating the strategic objectives of an organisation vertically through its levels from the top down and, then, assigning measures to those objectives from the bottom up. Therefore, in this study, the conceptual measurement framework should show how objectives are disseminated from the senior management of an organisation through to the operators. Anderson and McAdam (2004) speculated that using this characteristic assists in monitoring organisational performance as performance information is transmitted upwards and downwards between organisational levels.

This measurement framework should also show how the performance measures are populated with data from the bottom level of the pyramid upwards (Lynch and Cross, 1995). The intended framework needs to clearly explain potential relationships among the elements forming different dimensions of business performance (Neely *et al.*, 2000). In addition, the conceptual measurement framework should have a notion of causality in that internal efficiency of organisational performance can impact the external effectiveness of the generated outputs and the way customer and other external stakeholders might perceive it. This notion was expressed by Lynch and Cross (1991), Fitzgerald *et al.* (1991), and the European Foundation for Quality Management-Excellence Model (1992). Moreover, the conceptual measurement framework must show clear relationships between different performance perspectives similarly to the balanced scorecard developed by (Kaplan and Norton, 1992).

The measurement framework was designed to follow a scoring system similar to the one developed by the EFQM Excellence Model which gives equal weight to “enablers” and “results”. This system will be developed in a later phase of this study (see Chapter 7). Focusing on stakeholders is another principle that the conceptual performance measurement should have as recommended by Neely *et al.* (2001) in the development of their Performance Prism. This shows that the framework considers the views of a wider range of players, who are affecting in or are affected by the business, such as investors, customers, employees, and policy makers (Tangen, 2004).

The principles mentioned above were derived from well established frameworks. Bassioni *et al.* (2005) considered that adopting the standards of existing measurement frameworks contributes to the validity of new frameworks. However, the framework was developed by adopting these principles and by synthesising construction project performance dimensions, criteria and measures with the performance dimensions, criteria and measures of educational institutions to form an overall conceptual framework (Tables 4.6a and 4.6b). In these two tables, the performance of construction projects in education sector, as mentioned above, has two perspectives; performance drivers and performance results. The performance drivers perspective includes performance dimensions, criteria and measures that are critical to determine the overall performance to achieve the project’s objectives. Therefore this perspective span through the construction project delivery stage.

It was established in Chapter 3 that some aspects of project success can only be assessed after the actual completion and handover of the construction project. Those aspects relate to the core business of the initiating organisation the performance. They form the ultimate results of undertaking the project. Therefore the second perspective of the overall project performance is associated with performance results. Based on the above discussion, these results are achieved in the project post-delivery stage. Literature grouped them in dimensions, criteria and measures of performance (Tables 4.6a and 4.6b).

Performance perspectives	Project stages	Performance dimensions		Performance criteria		Performance measures
		Construction project	FE/HE institutions	Construction project	FE/HE institutions	
Performance drivers	Delivery stage	Project efficiency		Time		Construction time
				Cost		Construction cost Life cycle cost
				Quality		Quality (Construction service)
				Safety		Accident Incident Rate (AIR) Accident Frequency Rate (AFR) Lost Time Injuries (LTI)
				Satisfaction		Customer satisfaction Team satisfaction
				Productivity		Productivity of construction work
		Impact on customer	Customer			Absence of problem Library and information services Continuity of educational activities
			Process		Administration and operations	High quality service process (administration) Teaching facilities Academic staff quality Resource input
		Preparing for the future	Learning and growth		Governance and management	Knowledge transfer and relationships (articulation) Staff and human resource development

Table 4.6a: The Conceptual Performance Measurement Framework (Performance Drivers Perspective)

Performance perspectives	Project stages	Performance dimensions		Performance criteria		Performance measures
		Construction project	FE/HE institutions	Construction project	FE/HE institutions	
Performance results	Post-delivery stage	Business success	Financial, estates and infrastructure	Financial	Cost effectiveness Space productivity	
				Human resource cost	Human resource cost	
				Asset usage	Space efficiency End user satisfaction with the shared facilities End user satisfaction with the shared space	
				Quality (product)	Performance (test and commission) Overall customer satisfaction	
			External impact	Institutions image	Student recruitment Student retention Student achievement Students’ satisfaction with the shared education Public service/outreach	
		Sustainability	Environmental impact	Energy Water Waste/materials recycling Visual impact		
				Social impact	Cultural heritage Public access	
				Economic impact	Employment of labour Resettling cost of people Rehabilitating cost of ecosystem Supplier satisfaction Recurring business	

Table 4.6b: The Conceptual Performance Measurement Framework (Performance Results Perspective)

4.11 Conclusion

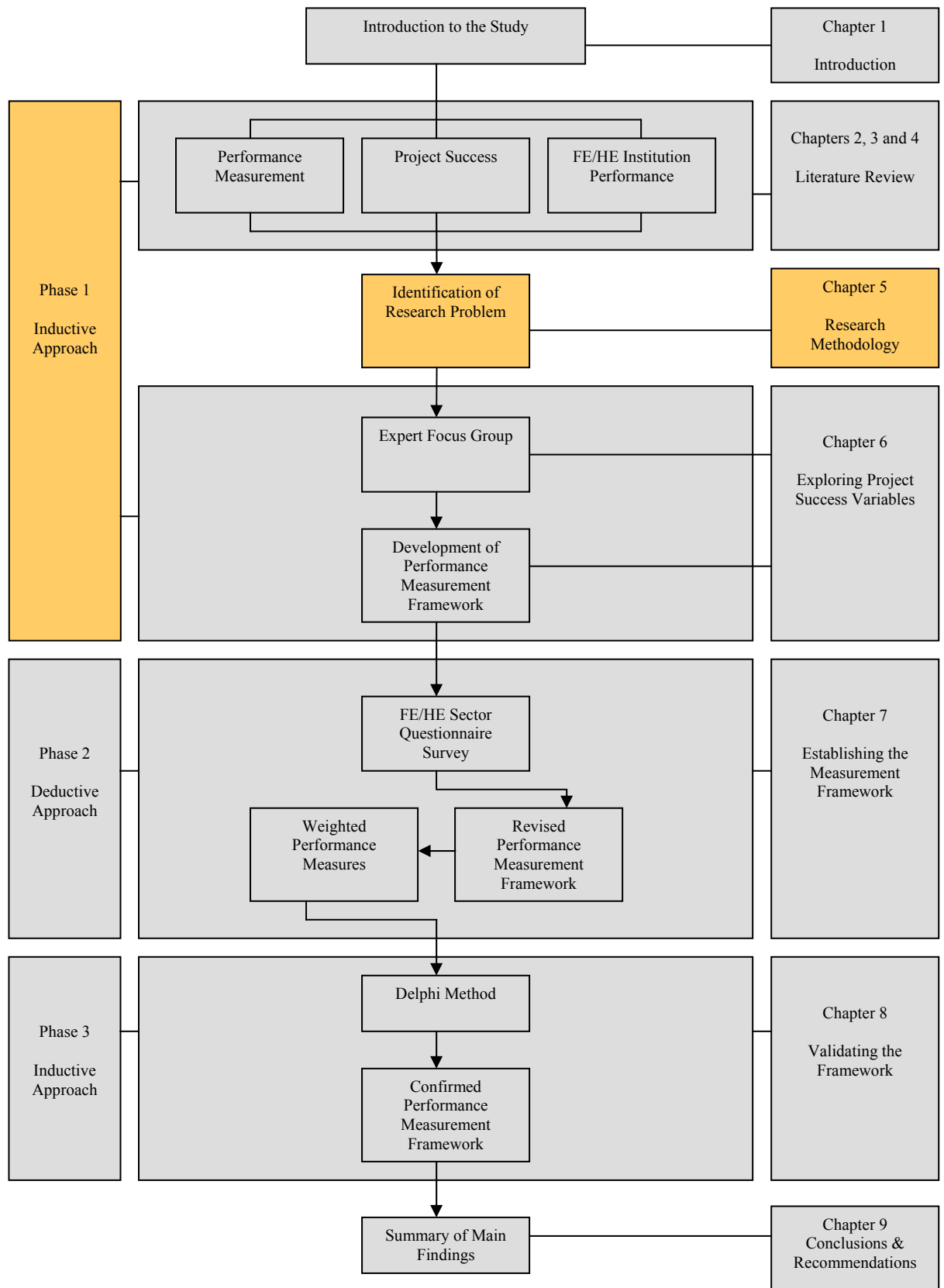
This chapter reviewed the nature of further and higher education and highlighted the importance of post secondary education in producing value through ‘knowledge products’. In addition, this chapter emphasised that created value will not only benefit students who receive educational services, but it will also impact other stakeholders such as parents, potential employers and society who also have an interest in the level, appropriateness and suitability of education.

The challenges that face further and higher educational institutions were reviewed. These challenges relate principally to increasing the quality of education and the student experience while at the same time managing resources, mainly the physical learning environment, effectively and efficiently.

This chapter underlined that collaboration between educational institutions can assist in meeting the above challenges. Scottish Government policy is directing the collaboration towards the co-location of more than two institutions in one place so that they can share particular educational services and facilities.

Undertaking projects of this type is usually associated with construction work to build a new shared campus or to extend an existing one. Therefore, it is particularly important for the construction project to contribute to finding a solution to the problems facing FE/HE institutions by providing a learning environment that supports educational activities and enhances institutional performance. It is for this reason that measuring the performance of educational institutions was reviewed and discussed. The findings of this review were used to develop a framework by synthesising several frameworks. This framework will be incorporated in a larger measurement framework that can be used to measure the performance of co-location type of construction projects while relating them to the educational businesses they support.

Chapter 5: Research Methodology



Chapter 5: Research Methodology

5.1 Introduction

This chapter presents the theoretical positioning of the research concerning the success of construction projects used to facilitate further and higher education (FE/HE) co-location. It synthesises the conclusions of chapters two, three and four to propose a valid research design. A research philosophical position is established; appropriate research methodologies are identified and corresponding methods for collecting and analysing primary data are selected and justified.

5.2 Rationale

The further and higher education sector has encountered increases in student numbers, financial constraints and the need to meet escalating demand for improved quality of the education. Students, parents, relatives and prospective employers are more concerned about the role of higher education in helping students to develop the skills necessary to excel in their future careers. However, reductions in financial resources have caused many FE/HE institutions to face problems related to the provision of an effective educational environment; particularly the physical assets that support the educational process (Amaratunga and Baldry, 1999). Technological aspects such as advances in building materials and services and the growth of information technologies used in teaching and research spaces impose further challenges on FE/HE institutions.

In response to these challenges, Scottish Executive (2005, p6) policy suggested that *“collaboration between institutions, shared support services, new approaches to estates management and development, better procurement and pooling of research capacity”* will guarantee superiority and value for money. Co-locating educational operations on a shared site can be an innovative solution to respond to the challenges faced by FE/HE institutions. Co-location is currently considered an effective, efficient and strategic approach for supporting education infrastructure in a particular location. This approach can also provide significant financial, curricular, and structural advantages not achievable through the occupation of separate estates.

Assisting further and higher education institutions in tackling escalating running costs and, at the same time, meeting the growing demands of students for better quality and value for money necessitates effective techniques for measuring the performance of co-location projects (which are themselves usually facilitated by a construction project to house new functions). Developing a framework to assess how successful the co-location project is doing will enhance the ability of educational institutions to manage and adapt to the sharing of services and facilities.

The literature review established that project success as a concept has been defined differently by different authors and practitioners. Approaches to determining project success criteria have evolved over time. The discussion in Chapter 3 showed that project success depends mainly on an appropriate project definition. A comprehensive definition is required (Winch, 2009). Projects should not be looked at as activities separate to the client's business which tries to achieve short-term objectives. Instead, they need to be considered as long-term strategic initiatives (Andersen *et al.*, 2006) by which organisations deploy their plans and achieve their objectives (Shenhar *et al.*, 2007b). Organisations usually initiate projects to realise business benefits (Shenhar *et al.*, 2000) or to respond to change caused by economic, technological and social stimuli (Walker, 2007). A project should have a smooth integration into the core business of the client (Kelly, 2005). A project's full potential can only be realised a long time after its completion.

Based on the above, traditional success criteria of finishing the project on time, within budget and to the required specifications (quality) are inadequate to describe project success. Measuring project success on the basis of these three criteria alone may lead to deficient and misleading judgement (Shenhar *et al.*, 2007a). They do not adequately reflect the client's need for the project to create competitive advantage (Shenhar, 2007). However, understanding of project success has been reformed by the evolution of a number of relevant concepts such as: distinguishing between project management success and project success (de Wit, 1988); extending the concept of project success to cover intangible perspectives of the implementation "process" such as psycho-social outcomes and distinguishing between "project task outcomes" and "project psycho-social outcomes" (Pinto and Pinto, 1991); distinguishing between strategically managed projects and operationally managed projects (Shenhar *et al.*, 2000); linking the creation

of the investment assets (the “project”) to the consequent operation of those assets to attain certain benefits (Freeman and Beale, 1992); and distinguishing between the “project” macro and micro perspectives (Lim and Mohamed, 1999) and time-based criteria that go beyond the conventional project lifecycle into achieving business benefits (Shenhar *et al.*, 1997; Atkinson 1999; Sadeh *et al.*, 2000) and the place of the “project” within the client’s core business (Kelly, 2005).

5.3 Research Problems

The relationship between project success and performance measurement was articulated by Chan *et al.* (2002) who asserted that performance measures can be used to evaluate construction project success. Performance measurement has been defined by Sinclair and Zairi (1995, p50) as “*the process of determining how successful organisations [or projects] have been in attaining their objectives.*” Similarly, de Wit (1988) suggested that project performance can be measured using project success criteria and comparing the performance with predetermined objectives used to determine project success.

Although performance measurement has gained popularity in the construction industry, the construction management literature gave it inadequate consideration and failed to address the wider stakeholder requirements that cover tangible as well as intangible concerns (Love and Holt, 2000). Chapter 3 showed that client concerns regarding the business that the construction project is supporting need to be addressed. Ward *et al.* (1991) asserted that project performance must not only be measured by assessing the degree to which the project objectives are met, but must also consider the nature of the client’s business.

The relationship between construction project success and long-term business success created the need for a comprehensive performance measurement framework that defines the contribution of the construction project in supporting FE/HE collaborating institutions through providing a learning environment that enhances the shared educational activities. Developing a measurement framework that emphasises this link will bridge the gap identified in the literature which did not address the project as a facilitator for the core business of the client by recognising its role within that business.

Obtaining a comprehensive perspective of the performance of the construction projects supporting FE/HE co-location requires exploring the nature of further and higher education institutions and their challenges. It requires shifting the focus of FE/HE institutions to the long-term considerations of stakeholder issues such as the strategies of education institutions, educational activities, and student and staff requirements. This can be supported by adopting performance measurement practices that include broad, progressive, dynamic, and comprehensive measures (Love and Holt, 2000).

Bassioni *et al.* (2004) stated that one of the key challenges in construction is strategy deployment, an issue that should be taken for granted when developing performance measurement frameworks. Within this context, Morris and Jamieson (2004) asserted the importance of translating organisational strategies to project strategies in improving business performance. Kagioglou *et al.* (2001) pointed out the importance of using the ‘right measures’ to measure the ‘right things’ in any measurement framework. Further, frameworks need to show the relationship between the different measures from a holistic perspective to establish a basis for identifying possible improvements (Kagioglou *et al.*, 2001). Nonetheless, Bassioni *et al.* (2004) claimed that cascading and aggregating performance measures vertically between the organisational and project levels have not been sufficiently addressed. Similarly, Leinonen (2001) emphasised that the way by which performance data can be integrated is a major challenge of developing a performance measurement framework. Other challenges were pointed out by Bourne *et al.* (2003) who found that assessing the relative importance of performance measures and quantifying those measures that are qualitative in nature are complex issues to tackle.

5.4 Research Aim and Objectives

The problems highlighted above suggest that there is an opportunity to explore the performance of a FE/HE co-location project facilitated by a construction project and the way by which its performance can be measured. Consequently, research is required to investigate this problem. Hence, the aim of this study is:

To develop a comprehensive performance measurement framework for FE/HE co-location projects to provide further and higher education institutions with a structured way of measuring the performance of co-location projects.

To achieve this aim, the study adopted the following objectives:

1. To explore the performance measurement frameworks used to assess general business performance;
2. To identify what constitutes “successful” projects by investigating success criteria and dimensions;
3. To review and examine how performance is measured in the construction industry;
4. To explore the nature of the FE/HE educational provision challenges facing FE/HE institutions and ways to measure the performance of FE/HE institutions;
5. To propose methods to measure the quantitative and qualitative aspects of co-location project success; and
6. To suggest a practical way to aggregate a set of performance measures into a single indicator.

5.5 Research Philosophies and Approaches

A basic requirement that faces any researcher undertaking management research is the need to construct a philosophical position towards their enquiry. A consideration of key philosophical orientations to research practice is essential and, in particular, the various approaches to theory development and testing in a research process (Crowther and Lancaster, 2009). In addition, Creswell (2003) suggested that the practice of research combines philosophical assumptions, general approaches (strategies) and the use of particular procedures (methods). A methodological framework is required which brings together these components of philosophical assumptions, strategies and methods into a research paradigm (Creswell, 2003).

Research philosophy is related to the nature of the knowledge formed by the researcher’s predilections and biases that influence how sees the world. This, in turn, informs the researcher’s strategy and method selection (Saunders *et al.*, 2009). Dainty (2008) claimed that research methods should be selected in parallel with consideration

of the ontological and epistemological positions that the researcher holds. Guba and Lincoln (1994) made the point that inquiry into an appropriate research has priority over the selection of research methods. To quote:

“Both qualitative and quantitative methods may be used appropriately with any research paradigm. Questions of methods are secondary to questions of paradigm, which we define as the best basic belief system or world view that guides the investigation, not only in choices of method but in ontologically fundamental ways.” (Guba and Lincoln, 1994, p105)

Dainty (2008) claimed that these theories of knowledge can be called paradigms. Paradigms inform the researcher’s choice of research methodology. They are explained in more detail in the next section.

5.6 Research Paradigms

Research design requires a frame to be established within which the research work will be positioned (Maxwell, 2005). Babbie (2009, p32) called this frame a “*paradigm [that] underlines social theories and inquiry.*” Mertens (2009, p7) described a research paradigm as “*a way of looking at the world*”, while Babbie (2009, p32) stated that paradigms “*provide logical frameworks within which theories are created.*”

The paradigm comprises philosophical assumptions that inform and steer the researcher’s thinking and inquiry (Mertens, 2009). In other words, positioning the research within a ‘paradigm’ causes it to inherit philosophical assumptions that describe the nature of the world (ontology) and the way the researcher understands it (epistemology) (Maxwell, 2005). Paradigms usually incorporate certain methodological strategies connected to the chosen assumptions (Maxwell, 2005). Using paradigms helps the researcher to understand and classify sophisticated beliefs and world views (Blaxter *et al.*, 2006). Within this context, Guba and Lincoln (1994) suggested that the assumptions of a certain research paradigm can be defined by answering three queries:

1. The *ontological* query that is linked to the form and nature of reality;
2. The *epistemological* query that is linked to the researcher's belief about knowledge; and
3. The *methodological* query that is linked to how the researcher figures out what can be known.

5.6.1 Ontological Orientation

This approach to developing theories in the physical and social sciences is based on suggestions about the 'nature of phenomena' (Crowther and Lancaster, 2009) or the 'nature of social entities' (Bryman and Bell, 2007, p22). This raises the importance of the assumptions that the researcher holds about the world; the way it works and their predilection towards particular views (Saunders *et al.*, 2009).

The opinion of Bryman and Bell (2007, p22) is that an ontological position is formed by considering the way that research problems are looked at and dealt with. The first view considers the examination of research problems entailing the inspection that such problems have a reality that is separated from the perception of social actors. Therefore they need to be addressed objectively. This ontological position is called *objectivism*. The second view considers examining research problems entailing the perception that they represent constructions formed by perceptions and performances of social actors. Consequently, research problems should be addressed subjectively (Bryman and Bell, 2007, p22). This ontological position is called *subjectivism*. Similarly, and in an attempt to understand this philosophical approach, Saunders *et al.* (2009) pointed out two aspects of ontology. The first one is *objectivism* which describes the view that entities exist in reality in a way that is independent of social actors. The second aspect is *subjectivism* which represents a different view in that reality is structured by considering the perceptions and actions of social actors (Saunders *et al.*, 2009).

This study concerns the development of a performance measurement framework that covers objective and subjective performance measures. In addition, the study must provide a structured method of aggregating the performance measures that will allow the client organisation, which initiates the co-location project, to obtain aggregated measures at different performance levels.

The process of measurement can be structured by a framework of performance measures that are grouped in such a way to show particular dimensions of performance (Folan and Browne, 2005). Therefore, the performance measurement framework, from the researcher's point of view, represents a set of facts that, once developed, become part of a greater system for managing the performance of a co-location FE/HE project. Furthermore, the framework allows the level of performance to be determined and, consequently, the success of the project in achieving its goals. In light of the above, to develop a performance measurement framework that exists as a phenomenon outside the people who might use it, the researcher should adopt an *objectivist* position regarding this particular phenomenon.

On the other hand, the researcher considers that the performance measurement framework of the FE/HE co-location project is a developed form of "reality" that emerges from the perceptions of people who have been or might be involved in the future in managing FE/HE co-location projects, and which regards the success of such projects.

Neely *et al.* (1997) recognised the need to use multi-dimensional measures when developing a performance measurement framework to attain a balanced view of the business. This means that the framework should include quantitative and qualitative performance measures. Consequently, these measures are informed by the people who are measuring and their perceptions of the performance metrics they are dealing with. Therefore, the developed performance measurement framework cannot be considered as an external reality. The framework development involves active participation of people in constructing this social phenomenon. As a result, the researcher has a *subjectivist* view of this reality.

On the basis of the above discussion, the researcher has mixed ontological views represented by the *objectivist* and *subjectivist* views. These two philosophical positions will be adopted to develop a comprehensive performance measurement framework for FE/HE co-location projects.

5.6.2 Epistemological Orientation

Epistemology is a philosophical position related to knowledge theory which attempts to discover how we can know and what we can know (Coyle, 2007, p11). Within this context, an epistemological orientation is an issue related to finding an answer to what can be (or must be) considered acceptable knowledge (Saunders et al., 2009 p112). This issue draws attention to the way the researcher deals with a social phenomenon to answer his research questions.

Researchers may choose to examine a social phenomenon by applying the principles and procedures of the natural sciences (Bryman and Bell, 2007, p16). In such cases researchers are expressing a *positivist* view. The notion of positivism is that people's behaviour can be measured in an objective and scientific method in the same way objects are measured in the natural sciences such as physics, biology or chemistry. Positivists consider that the world is governed by natural laws that control objects' behaviour (McNeill and Chapman, 2005).

On the other hand, researchers may adopt an opposite position which considers a distinction between human behaviour and the logic of the natural sciences in that social phenomena are examined on the basis of the way people make sense of the surrounding world (Bryman and Bell, 2007, p16). This philosophical position is referred to as *interpretivism*.

Interpretivism considers that people in the social world are different and behave differently because they have the ability to think, take decisions and act consciously and distinctively in response to a social problem (McNeill and Chapman, 2005). Moreover, interpretivism stands on two basic ideas: phenomenology and symbolic interactionism. While phenomenology concerns how people make sense of their surrounding world, interactionism refers to the constant interpretation of the behaviour of other people when dealing with them and this process modifies and informs our understanding and consequent actions (Saunders *et al.*, 2009 p116). Hence, the researcher needs to understand these differences between people in order to develop knowledge (Saunders *et al.*, 2009 p116).

In addition to the previous two philosophical positions, researchers may consider that the knowledge acquired by applying the roles and procedures of the social sciences, a subjective understanding of human behaviour, or both would generate acceptable knowledge and can be decided according to the research question (Saunders *et al.*, 2009 p116). Researchers who have this view are following a philosophical position that is known as *pragmatism*.

Pragmatism refers to another philosophical concept that provides a realistic and sensible framework to using more than one method of research (Jupp, 2006). Pragmatists are against the ideas that consider quantitative and qualitative approaches to research to be fundamentally contradictory. They simply see that each of these approaches has advantages and disadvantages and can be mixed to solve a research problem (Jupp, 2006). Moreover, pragmatists claim that the research problem dictates the researcher's ontological and epistemological orientations (Saunders *et al.*, 2009). According to Creswell (2003, p11), the development of knowledge, based on this concept, happens as a result of "*actions situations and consequences rather than antecedent conditions*".

Researchers, when adopting an epistemological position, usually either adopt the one they favour and then use research methodologies and methods that are commonly associated with it. Alternatively, they may prefer to follow a particular research methodology and consequently shape their research into the form that is linked to the philosophical assumptions of the epistemology connected to these adopted methodologies (Coyle, 2007, p12).

The research aim and objectives necessitated identifying the co-location project success dimensions and performance criteria and measures. Therefore, the researcher considered that following the interpretivist view was appropriate to this research because utilising this approach for acquiring knowledge enriched the study by gaining the opinion of the sector and co-location project experts on what they think is important, should they have the chance to be involved in such a project in the future.

The research also takes into consideration that the performance measurement framework needs to be broken down into a number of levels that will allow senior management in addition to project managers to direct and control the project

performance, and offers continuous improvement to the project processes. Dealing with this challenge requires obtaining tangible measures that quantify the intangible aspects of project success. This will facilitate benchmarking to compare actual performance against set targets by combining a number of measures into a single measure representing aggregated performance. Therefore, the positivist paradigm, in the opinion of the researcher, was considered a suitable approach to follow in this situation.

Thus, and in the light of using the interpretivist and the positivist philosophical positions to answer the research problem, the researcher is adopting a pragmatist epistemological orientation. This adopted paradigm is presented in Figure 5.1

Ontology	Epistemology			
		Methodology		
		Approach	Methods	Data collection techniques
Subjectivist	Interpretivist	Inductive	Qualitative	Focus group
Objectivist	Positivist	Deductive	Quantitative	Questionnaire
Subjectivist	Interpretivist	Inductive	Qualitative	Delphi

Table 5.1: A pragmatist research paradigm for this study

5.7 Research Methodology

Adopting different epistemologies results in the use of different research methodologies and methods (Coyle, 2007, p11). The term ‘methodology’, according to Saunders *et al.* (2009, p3), indicates theoretical frameworks of how to conduct a research study. In other words, research methodology is about the way that the researcher discovers what he considers as acceptable knowledge. However, there are two approaches through which a researcher can either test a theory or build a theory. These are the deductive approach and inductive approach. Figure 5.2 links these to the methodology and the research design of this study.

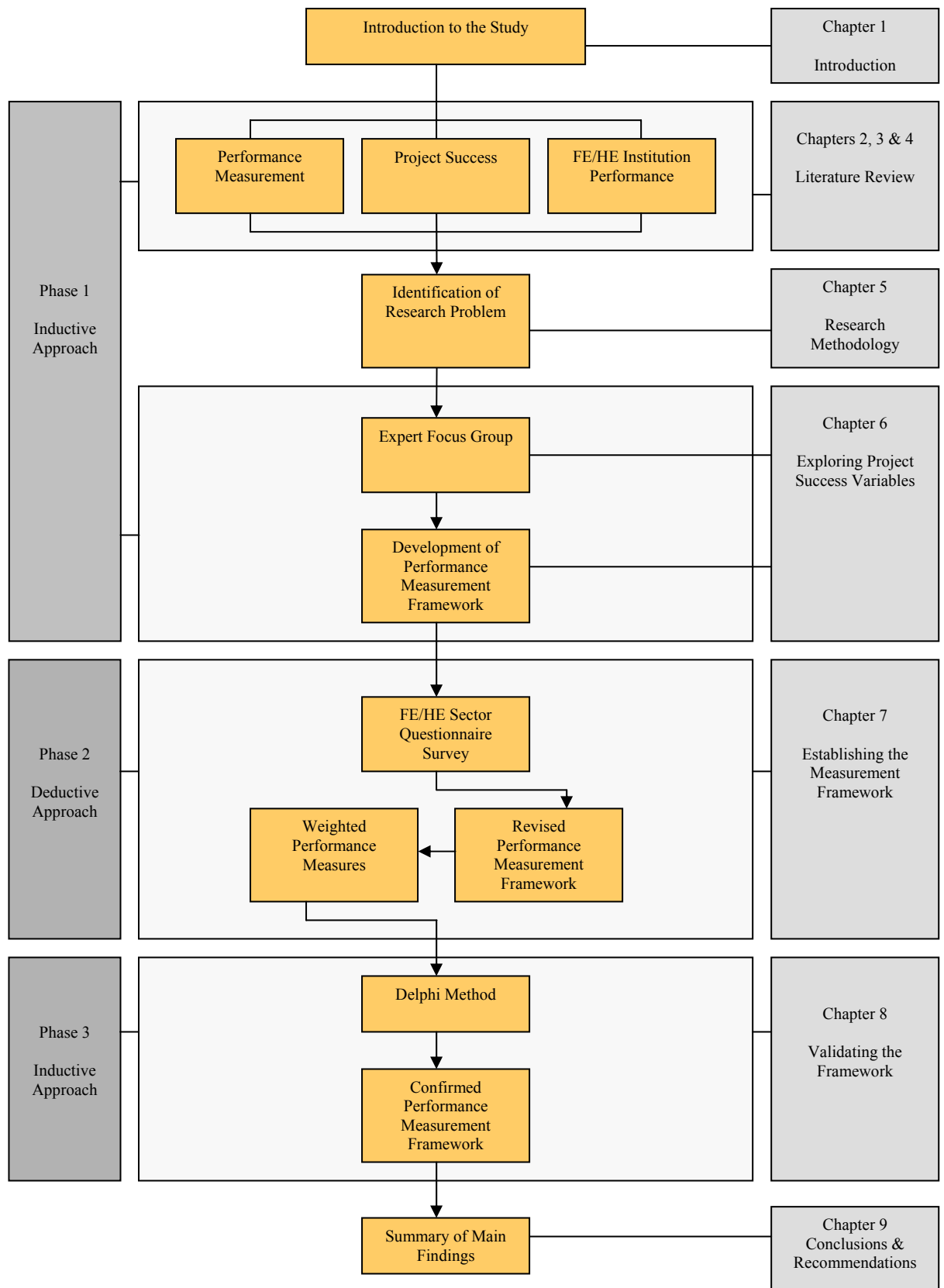


Figure 5.2: The Research Flowchart

5.7.1 Inductive Research

Using this approach, the inquirer observes the empirical world and then builds hypotheses and theories based on data collection and analysis (Gill and Johnson, 2010, p56). This approach starts with observations that describe a social phenomenon and then progresses to provide explanations (Crowther and Lancaster, 2009, p31). Those explanations are usually developed in a form of frameworks, hypotheses or theories (Crowther and Lancaster, 2009, p31).

In the first phase, this model of reasoning comprised the literature review. It has been followed to collect information and data about project success dimensions and criteria, performance measures and characteristics of measurement frameworks. The data collected were synthesised and used to form a conceptual performance measurement framework for co-location construction projects. The framework, resulting from the literature review, was then discussed in a focus group to gain more information and insights about the way co-location projects specifically can be measured. This approach was also used in the third phase of the study to validate the developed measurement framework using the Delphi survey.

5.7.2 Deductive Research

In this approach to research, conclusions are developed through “logical reasoning” (Ghauri and Gronhaug, 2010). Although these developed conclusions are not required to be true in the real world, they need to make logical sense. Researchers following this approach build theories or hypotheses before empirically examining them to determine their validity (Crowther and Lancaster, 2009). In this approach to research, a conceptual and theoretical structure is formed and then the implications of the developed theory are tested in a following stage (Gill and Johnson, 2010, p28). It is worth noting that the basis of the researcher’s conceptual theory is not as significant as the logic of the process of developing the theoretical structure and the way it is tested through exposing that conceptual theory to empirical questioning (Gill and Johnson, 2010, p28). This deductive approach is typically associated with philosophical assumptions related to the ‘positivist’ paradigm (Gill and Johnson, 2010, p33).

The difference between these two approaches is that the deductive approach is ideal to follow if the subject in focus has been extensively researched and a conceptual framework hypothesis can be constructed from the rich literature around the studied area (Saunders *et al.*, 2009, p127). On the other hand, if the research study is centred on a subject which is exploring a new area and one that has limited literature, a researcher's ideal alternative is to follow an inductive approach so that data are collected and analysed, and then conceptual hypotheses are suggested and presented (Saunders *et al.*, 2009, p127). In a similar way, Gill and Johnson (2010, p56) explained that the result of an inductive approach is a theory that is grounded in observation.

The deductive approach was used in the second phase of this research to establish the performance measurement framework developed by the inductive approach in the first phase of the study. In addition, this approach was used to produce weightings for combining a group of performance measures into a single indicative measure.

5.8 Research Methods

Research methods are the techniques that researchers use to collect and analyse data (Saunders *et al.*, 2009, p3). Dainty (2008) conducted a study to investigate the research methods used by construction management researchers and found that quantitative and qualitative methods and mixed methods are the main used approaches. In this research the mixed methods approach including quantitative and qualitative methods was used to solve the research problem.

5.8.1 Qualitative Methods

A qualitative approach is another methodological approach that is 'subjective' in nature (Naoum, 1998), and that the researcher adopts the constructivist view to create knowledge (Creswell, 2003). The opinion of Fellows and Liu (2008) is that in qualitative research, the research area is explored in an attempt to increase understanding of the subject and to gather relative data in order to create new theories. Qualitative methods attempt to identify reasons for things that happen by assigning meanings to what individuals attribute to social phenomena (Fellows and Liu, 2008, p9). In this research, the qualitative methods included the focus group technique and the Delphi method. They are explained later in this chapter.

5.8.2 Quantitative Methods

Quantitative research is a methodological approach that is ‘objective’ in nature (Naoum, 1998) and, through which, researchers mainly adopt a positivist view of knowledge development (Creswell, 2003). Hence, investigators who follow the quantitative approaches tend to apply ‘scientific methods’ so that their study produces specific results in addition to propositions and hypotheses (Fellows and Liu, 2008). The quantitative method in this study comprised a questionnaire survey used to produce the weightings necessary for combining many performance measures into a single measure.

5.8.3 Focus Group Workshop

Greenbaum (2000) defined the focus group method as a qualitative research technique used to collect data through a group of people drawn together in one place to deal with questions that are of great concern to the researcher. Focus groups are used to gain insights, ideas and concepts, in an exploratory manner, to reach a consensus about an issue that is understood differently; uncover particular factors characterising a problematic case; and collecting further information that can be used to support other research methods (Krueger, 2009). Morgan (1997, p11) asserted that this technique is mainly appropriate for exploratory research in which not much information is known about the subject.

Those situations mentioned above apply to the current research. The literature review of business performance measurement and project success and measurement in construction project success has revealed many lists of success criteria and performance measures. However, little is known about success dimensions and measures of FE/HE co-location projects. Therefore, in order to achieve the aim of this study, there was a need to explore the opinion of people who have experience in managing FE/HE co-location projects to gain their insights. In other words, there was a need to develop a set of success dimensions and performance measures that are specific to FE/HE co-location projects. A focus group complemented the study of general FE/HE institution performance criteria with those specific to co-location.

Krueger (2009) suggested that the ideal number of people in a focus group is between six and nine. He further added that choosing participants is driven mainly by the subject

and the goal of the study (Krueger, 2009). As this study addressed measurement of the performance of further and higher education co-location projects, the participants needed to have experience of this type of project. The project that focus group participants were, accordingly, involved in a project illustrative of co-location. This illustrative project was a significant source of information and data for the study.

The FE/HE co-location project of Heriot-Watt University and Borders College provided focus group participants. The two institutions, representing HE and FE institutions respectively, were undertaking a construction project to build a new shared campus at Galashiels in the Scottish Borders. The project provided representatives of a cross section of professionals to reveal success criteria for validation in the second phase of the research project.

Selecting the sample for the focus group workshop used “*purposive sampling*” by choosing people falling within certain categories (Morgan, 1997, p35). Those people were required to have reasonable knowledge and understanding of the subject underfocus and must be willing to discuss it (Bruseberg and McDonagh, 2002, p26). Consequently, participants were selected by considering their involvement in an ongoing co-location project. As explained in Chapter 1, a representative project was the Borders Campus co-location project which involves Heriot-Watt University and Borders College. The participants selected represented different positions in their institutions in addition to the positions they held within the co-location project organisation.

The co-location project organisation comprised joint strategy and management structures. These structures were directed by a Joint Strategy Committee which included senior representation from Borders College and Heriot-Watt University in addition to the Scottish Funding Council (the funding organisation). Reporting to this Committee was a Project Co-ordination Group that had the remit of overseeing the project work undertaken by five work streams formed to organise and co-ordinate different project activities. These five work streams comprised two construction projects that facilitated the co-location project (Netherdale Construction and Hawick Construction), branding and marketing the new institutional model (Marketing), preparing plans for academic collaboration (Academic Coherence) and ensuring cost-effectiveness and managing the

transition process through considering legal, facilities management, information and communication technology, human resources and change management (Management Structure and Savings). As a result, the sample comprised eight individuals representing the above mentioned five work streams management structures in addition to a consultant, a Chartered Surveyor who had worked for HWU for many years, the Project Manager and the Project Architect (Table 5.2).

Heriot-Watt University
Policy Officer (Funding Organisation) Director of Planning (HE) Service Director (HE) Project Architect Principal (FE) Assistant Director of Estates (HE) Project Manager Consultant (Co-location Chartered Surveyor)

Table 5.2: The Participants of the Focus Group Workshop

The focus group workshop used in this study was facilitated by the researcher. Easterby-Smith *et al.* (2008) suggested, in a focus group workshop, the researcher must provide a rationale for the workshop to the participants, and create and promote a suitable environment for discussions. Frey and Fontana (1993) described how the focus group usually takes the form of a structured interview, directed by the moderator. The focus group consisted of eight individuals who were chosen to represent different project disciplines. The focus group sought to consider, examine and discuss criteria critical to co-location project success. Another reason was to provide different opinions from various backgrounds and from diverse professional experiences. The facilitated workshop created an environment for open arguments and steered discussions.

The workshop comprised two parts. The first one dealt with identifying the “top five” performance measures considered by the participants to be the most indicative of FE/HE co-located project success. The justification for this was to gain understanding and insights into how the participants perceive success from different disciplines. This would provide the means to appreciate the group’s rational perception and understanding regarding different issues. In addition, it would also permit a diversity of ideas to be considered.

In the second part of the workshop, general success criteria and performance measures were reviewed with regard to the two performance perspectives: performance drivers and performance results. These two perspectives reflected two stages of the co-location project studied. The first stage was the delivery stage which includes project phases from inception through to construction handover and commissioning. The second was the post-delivery stage which started thereafter and which continues until the end of the proposed age of the facility. The 44 performance measures developed from the literature were assigned to these two performance perspectives (recall Tables 4.6a and 4.6b).

The participants were, accordingly, divided into two groups. Each group addressed performance measures in one performance perspective. The reasons for dividing the participants into two groups were related to allowing sufficient time for each group to deal with the subject in focus, adhering to the time limits of the focus group, controlling the discussion and ensuring that the focus of each group concentrated on one performance perspective of the co-location project performance. The participants were asked to rank the relevant performance measures found by the literature review based on their expertise and the participant's role in managing the co-location project. Responses were expressed on a three scale measure that included high, medium and low categories of importance.

The notes that were made by the participants were collected. Data were reviewed, coded and categorised. The results showed that new success dimensions and performance measures were needed for assessing the success of a FE/HE co-location project. Those dimensions and measures were then integrated in the general measurement framework developed from literature. The new framework, incorporating the new success dimensions from the literature, was then ready for the next phase of the study which comprised further investigation into how a co-location project can be successful and how the project's performance measures can be aggregated. The views of a wider FE/HE sector were surveyed using the questionnaire technique to achieve those objectives.

5.8.4 Questionnaire Survey

The use of the focus group technique for data collection is considered by many researchers as a preparatory step which is usually complemented by other forms of research methods such as survey questionnaires (Morgan, 1997 p.18; Langford and McDonagh, 2002, p.2). The focus group, in this study, generated different views that assisted in producing a conceptual performance measurement framework which in turn required further investigation through the use of quantitative research techniques. Therefore, the findings of the focus group workshop informed the design of a sector-wide questionnaire survey.

The purpose of the questionnaire was to explore the opinion of a wider sector of further and higher education professionals who, as potential clients of developing and constructing co-location campuses, have a relevant opinion of the characteristics of successful co-location projects. The questionnaire was also required to gather data to inform the aggregation of the different levels of performance perspectives, dimensions, and measures. The design of the questionnaire included questions which were both classification and attitudinal questions. Attitudinal questions explored the way respondents think, while classification questions explored who the respondents are (McCormack and Hill, 1997, p71). In addition, closed questions were used to collect data appropriately. Closed questions are usually used by researchers to limit the responses of the people to a pre-selected set of answers. They also have three types of questions: choice, scaled and ordered questions (McCormack and Hill, 1997, p71).

The sample in this research comprised a variety of people who were selected according to their professional roles within their organisations (see Chapter 6). They held positions that are equivalent to those who were involved in managing the FE/HE co-location project in Galashiels at the Scottish Borders of Heriot-Watt University and Borders College. Easterby-Smith *et al.* (2008, p212) asserted that the level to which a sample matches a total population informs the precision of questionnaire findings. Therefore, the sample selected represented people who might be in charge of managing such projects in real life.

Prior to distributing the questionnaire it was pilot tested to provide the opportunity to identify potential problems if the respondents did not understand and respond

appropriately to the questionnaire (Hayes, 2000, p75). The questionnaire was piloted in two institutions representing further and higher education institutions and which were undertaking a FE/HE co-location project. The sample included key people who directed the co-location project process between the two institutions. These positions included the co-location Project Manager, a consultant for that project, Director of Campus Services, Director of Estates, Director of Finance, Director of Planning, Principal and Assistant Principal. In addition, the pilot questionnaire was also sent to the Assistant Director of Capital Projects and two policy officers in the Scottish Funding Council, the funding organisation involved in the above mentioned co-location project. Piloting revealed a few comments related to the length of the questionnaire. The reason was that each question included a definition and brief description of a list of performance measures, the main subject of the study. Hence, changes were made to the questionnaire in that the defining statements became shorter and clearer. The final version of the questionnaire was distributed by email to management staff of further and higher education institutions in Scotland.

The data collected were analysed using factor analysis. This technique explores common attributes that a group of variables has and attempts to represent those variables in a fewer number of components or factors. It is important to note that this technique is concerned with the relationships between a numbers of variables in one group (Blaikie, 2003). It was used to reduce the number of performance measures, by identifying underlying components among their perception by questionnaire respondents, and examining the relationship between each group of measures. The results of this study phase progressed to the third phase in which the established framework and the aggregations method were validated. This was done through a research technique called the Delphi method.

5.8.5 Delphi Survey

To validate the performance measurement framework established in the previous phase of research, the researcher used the Delphi method. To quote from Linstone and Turoff (1975, p.3):

“Delphi may be characterised as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem.”

The Delphi method is a technique that explores and captures the opinions of a group of people who are considered experts in the subject of discussion through a series of structured data gathering rounds (Kahn, 2006, p.42). Participants of this method do not know the identity of other members of the group and should be physically isolated. They contribute to the research method by providing answers to a number of questions (Sweeney, 2009, p.215). Therefore, each one round in the Delphi method process offers the chance to combine the outcomes of the previous one, refine them and put them for further investigation until a consensus is reached (Kahn, 2006, p.42).

Ziglio (1996, p.14) stated that the number of participants in this method and the way by which they are selected to form a panel of experts is independent of sample size. Deciding who is to participate depends on having knowledge of the area under discussion. In addition, people who have experience or who are stakeholders can also be considered to construct the group of experts (Loo, 2002, p764). According to Ziglio (1996, p.14), a homogeneous group of participants could include ten members. This type of group is expected to produce good outcomes. In cases where a number of different individuals, in terms of knowledge, experience and stakeholder representation, sample size is expected to be greater Ziglio (1996, p.14).

In this research, participants were selected as they were stakeholders in a FE/HE co-location project: the Borders College and Heriot-Watt University Co-location project. The sample selected for the Delphi survey included people who participated in the first phase of the study when a focus group workshop was conducted. They represented the educational institutions and the funding body which, together, had experience of managing this type of project and educational collaboration. The total number of the group of experts was five which is less than the number that was recommended by Ziglio (1996). The reason for this is the uniqueness of this type of project in Scotland. This limited the number of people with relevant experience and expertise in FE/HE co-location projects. This can have implications for the reliability of the results of the third phase of the study. However, it is important to highlight that the study has been through

two phases prior in an attempt to explore, develop and revise a set of project success criteria and performance measures. This required using different research methods and techniques. This justifies, from the researcher's point of view, a Delphi panel with fewer than the recommended number of people.

The aim was to collect views about the developed framework including its performance dimensions, performance measures, and the method of aggregating different performance levels. To achieve this, Delphi review was implemented and complemented by a questionnaire similar to that used in the previous research phase. The process started by interviewing the members of the panel of experts who represented the FE/HE co-location institutions. Then, the members who represented the funding organisation were interviewed. In each session, the researcher began with a brief presentation of the performance measurement framework followed by structured discussion with the participant to elicit their opinions regarding the structure of the framework, its content and the proposed measurement and aggregation methods. The qualitative and quantitative contributions of each expert were then analysed and results reflected in alteration of the measurement framework before moving to the next session with another expert. The sequence of the sessions was not important. All members of the expert panel were emailed the results of the final session for final feedback. This gave all experts the opportunity to provide new insights and introduce new ideas, if they had any, in response to the results of the final session.

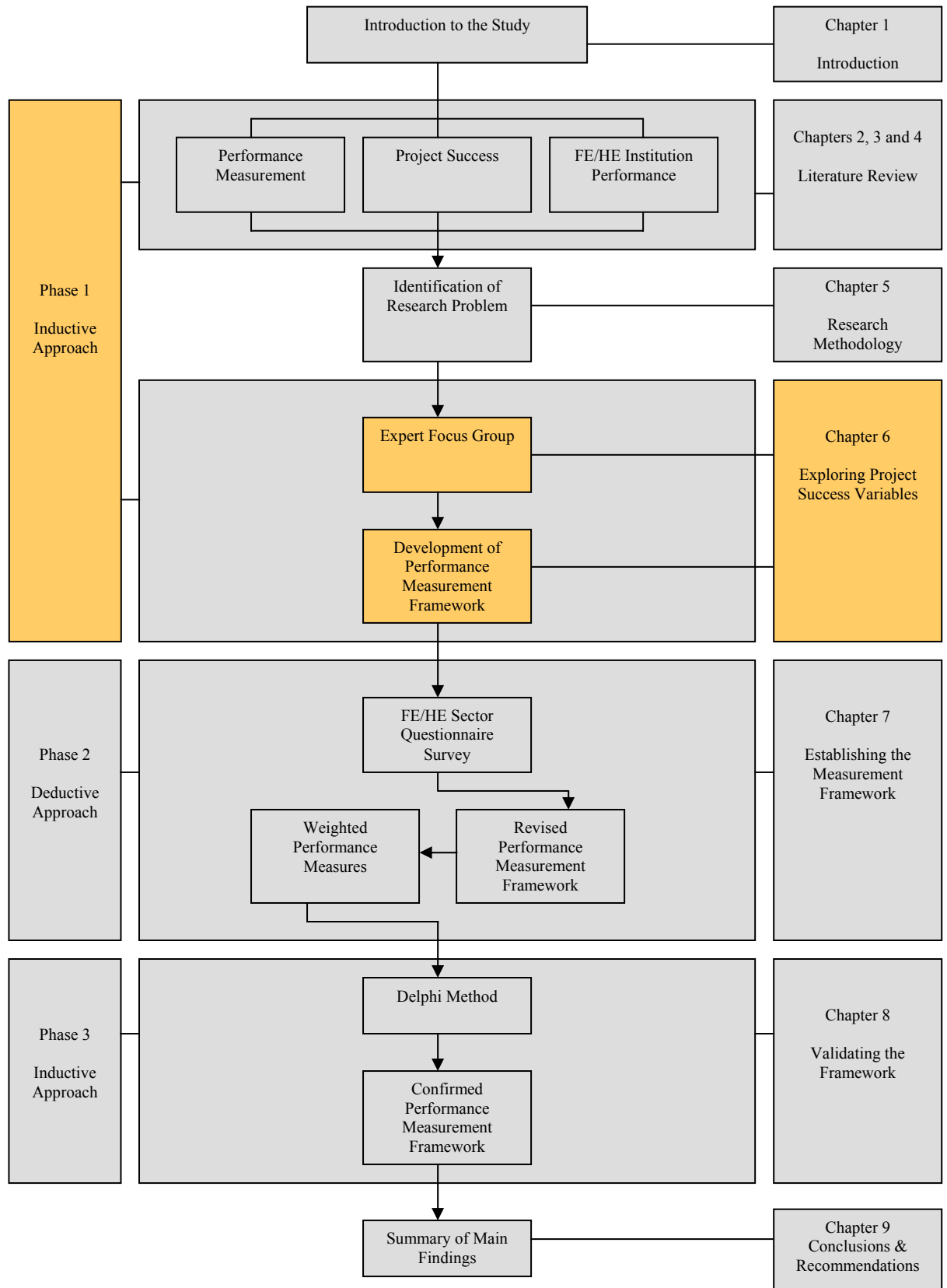
Discussions were recorded to capture additional explanations that were not written down during the session. At the end of each session, a validating questionnaire was left with the panel member to complete in light of the discussion and the explanations given by the researcher during it. Each member returned the completed questionnaire to the researcher after the discussion was concluded.

As the process progressed, the changes began to decrease. Consensus about the final form of the framework was reached after five iterations. The resulting framework and aggregation method were sent to all the panel members in a final iteration to seek their opinion of the finalised the framework.

5.9 Conclusion

This chapter presented a synthesis of critical issues highlighted in the previous three chapters to form a theoretical background to the research and define a research proposition. In addition, the researcher identified his philosophical position by adopting a pragmatist view of the world. The researcher believes that knowledge building does not follow particular theories. It is developed by individual experiences or actions, conditions and circumstances. Therefore, the researcher has used mixed methodologies found to be appropriate to solve the research problem. Consequently, the study was performed in three sequential phases. In the first phase an interpretivist research epistemology was adopted by following an inductive approach to explore and build a conceptual performance measurement framework. In the next phase, the researcher adopted a positivist view by using a deductive approach to test the framework and aggregate the variables of a multi-level measurement framework. The interpretivist view was used again in the third phase with an inductive approach adopted to modify and verify the developed the framework.

Chapter 6: Exploring Success Variables



Chapter 6: Exploring project success variables

6.1 Introduction

This chapter explains the process by which performance criteria that characterise successful FE/HE co-location construction projects were developed. It represents the first phase of the study that uses the literature review findings to inform the development of a conceptual framework for measuring the performance of FE/HE co-location projects. The consultative development process explored the opinions of people who represented stakeholders and who have experience in managing a co-location project. Data were collected using the focus group method.

This chapter starts by clarifying the logic of the conceptual framework development process. In addition, it justifies the use of the focus group method. Moreover, it describes the process of conducting the workshop and presents the outcomes of using this method. This chapter concludes by providing a modified version of the overall measurement framework; a tool further developed in later phases of this study.

6.2 Using the Focus Group Method

This exploratory nature of this phase of the study imposed an inductive qualitative research approach to elicit knowledge regarding the success of FE/HE co-location projects and the performance dimensions and measures required in a measurement framework.

Morgan (1997, p11) suggested that a focus group is particularly suitable in exploratory research in which not much information is known about the subject. By definition, a focus group is “*a carefully planned discussion designed to obtain the perceptions of the group members on a defined area of interest*” (Langford and McDonagh, 2002, p2). The focus group is a qualitative research method that uses the group interview technique to increase knowledge of a topic through face to face interaction (Langford and McDonagh, 2002, p3). Krueger (2009) claimed that focus groups can be used when: insights are required in exploratory research; different understanding of a certain issue exist among a group of people; a group of factors describing a complicated phenomenon

need to be uncovered; and when new ideas, concepts and more information about an issue to be generated for use in a more comprehensive study.

There are many reasons for using focus groups in research. Litosseliti (2003, p1) pointed out the usefulness of group interaction among the selected participants in order to explore the area of discussion. One of the main advantages of the focus group is that the participants are invited to take part in a collective environment to discuss issues of concern (Vaughn *et al.*, 1996, p15). Moreover, the focus group has advantaged over an individual interview as it creates a more productive environment that results from the group interaction (Krueger, 2009). Vaughn *et al.* (1996, p4) asserted that the transparent environment within which the focus group is carried out stimulates various opinions and reveals a more comprehensive understanding of the discussed subject. Furthermore, the input of the focus group participants may confirm, reject or modify the content of the previously generated lists (Fern, 2001, p7).

6.2.1 Purpose

The current research shows similar circumstances to those mentioned above. The literature review of general business performance measurement, construction project success and educational institutions performance measurement has revealed a number of success dimensions, criteria and performance measures (Tables 6.1a and 6.1b). On the other hand, the literature does not show sufficient knowledge about success dimensions and measures of FE/HE co-location projects. In other words, the developed list of performance measures does not describe the performance of an FE/HE co-location project. One of the objectives of the focus group workshop in this research is to generate a list of success criteria and performance measures that focuses for FE/HE co-location project performance on the basis of already existing measurement framework that was developed by reviewing the relevant literature on the subjects of construction project success and performance measurement. It is for that reason, exploring the opinions of people who have experience in managing FE/HE co-location projects and gaining their insights about this subject is a critical issue in achieving the main goal of this research.

6.2.2 Sample Selection

Selecting who is going to participate in the focus group workshop in this research has a great importance because their input will inform the development process of the overall measurement framework for the FE/HE co-location construction projects. Participants in focus groups can be selected by “*purposive sampling*” by choosing individuals who belong to particular categories (Morgan, 1997, p.35). Those individuals are required to have reasonable knowledge and understanding of the subject and must be willing to discuss it (Bruseberg and McDonagh, 2002, p.26). Therefore, participants were selected on the basis of their roles in an ongoing co-location project. That project was the Borders Campus co-location project which involves Heriot-Watt University and Borders College. The participant represented different positions in their institutions in addition to the positions they hold within the co-location project organisation.

The co-location project organisation comprised of joint strategy and management structures. These structures were directed by a Joint Strategy Committee which included senior representation from Borders College and Heriot-Watt University in addition to the funding organisation. Reporting to this Committee is a Project Co-ordination Group that had the remit of overseeing the project work undertaken by five work streams formed to organise and co-ordinate different project activities. These five work streams involved managing two construction project that facilitates the co-location project (Netherdale Construction and Hawick Construction), branding and marketing the new institutional model (Marketing), preparing plans for academic collaboration (Academic Coherence) and ensuring cost-effectiveness and managing the transition process through considering legal, facilities management, information and communication technology, human resources and change management (Management Structure and Savings). As a result, the sample comprised eight individuals representing the above mentioned five work streams management structures. The sample included: the Policy Officer (Funding Organisation), the Director of Planning (HWU), the Service Director (HWU), Assistant Principal (BC), Assistant Director of Estates (HWU), HWU Consultant, a Chartered Surveyor who had worked for HWU for many years, the Project Manager and the Project Architect.

The idea behind selecting those individuals was to consider, examine and discuss success criteria that are critical to a co-location construction project represented by

people working on a live project. Another reason was to provide different opinions from various backgrounds and from diverse professional experiences. Therefore, the workshop was an opportunity for creating such an environment suitable for open and steered discussions.

The range of the group of participants must not be very large and that the optimal group should not be comprised of quite a lot of categories although a particular variety level could be beneficial in that it may motivate participants to contribute different and even contrasting perspectives and go through informative discussion (Bruseberg and McDonagh, 2002, p.26). In addition, if the participants of the focus group workshop come from different professional backgrounds or reflect people of different categories then, the researcher needs to deal with such a situation with care (Krueger, 2009). The reason for this is to ensure that every contributing individual expresses his or her own views and do not expresses the views of a variety of categories they are supposed to represent (Krueger, 2009). However, those individuals might try to provide insights about the perceptions and views of total category of people and the extent to which the level of precision may differ significantly (Krueger, 2009).

6.2.3 Workshop Process

The content of the workshop session was designed to achieve the objectives of the current research phase. As this phase followed an inductive approach, the researcher gathers data describing participants' views of FE/HE co-location projects, and then analysed the collected data to produce a revised performance measurement framework for this type of projects.

The workshop was organised into two parts (Figure 6.1). The first one sought to establish the “top five” performance measures that indicate to a successful co-location project. The reason behind asking this question is to get insight into how the participants perceive success from different angles knowing that the participants come from different professional backgrounds and have different roles in construction and education organisations. Therefore, responses were expected to reflect different views of project success. The focus group workshop provided the means to reveal different

individual perceptions and understanding regarding what constitutes successful FE/HE co-location construction projects and permitted those diverse ideas to arise.

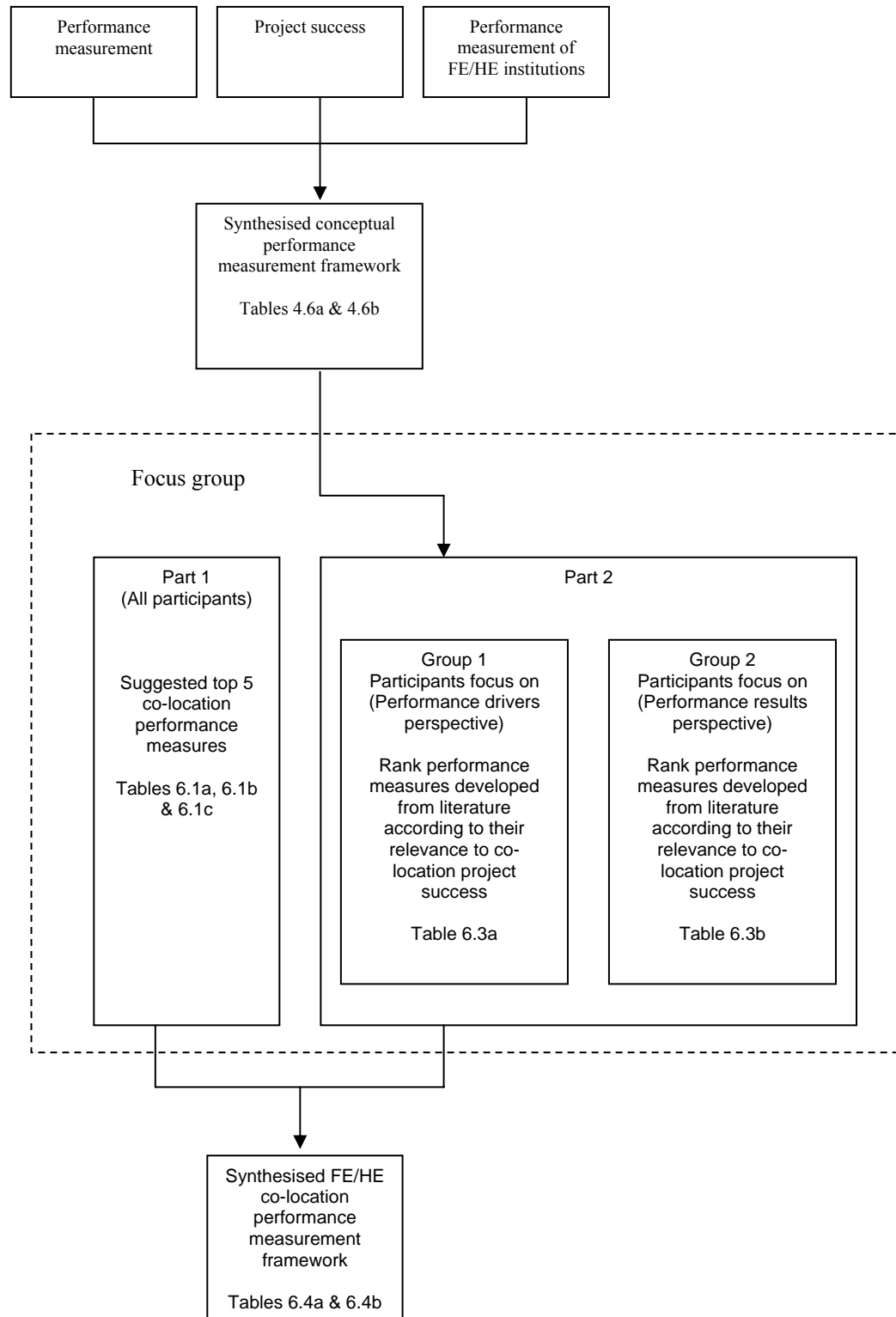


Figure 6.1: Application of the Focus Group Method to Framework Development

The second part of the focus group elicited the participants' collective responses regarding the importance of the proposed performance measures in the developed framework. This framework, as mentioned earlier in this chapter, was developed based on the literature review. As part of the exercise, the project success criteria and performance measures were split into two main parts corresponding to the proposed two performance perspectives; performance drivers and performance results. Consequently, the 44 performance measures, developed from literature (Tables 4.6a and 4.6b), were divided and allocated between the two performance perspectives.

The participants were split into two groups. Each group dealt with one performance perspective and its project success dimensions and measures. The first group, which dealt with the performance drivers perspective, comprised the Director of HWU Borders Campus Services, the Assistant Director of HWU Estates, a consultant, Chartered Surveyor, who had worked for HWU for many years and the Co-location Project Manager. The second group, which dealt with the performance results perspective, was formed from the HWU Director of Planning, the project architect and the Borders College Assistant Principal.

Participants were divided into two groups for four reasons. The first reason is to permit enough time for each group to discuss the list of performance measures they have in hand. In addition, time constraints made the opportunity for all the participants to consider the long list of proposed performance measures difficult. The question in this part of the session required discussion among the participants. Therefore, the researcher considered that the discussion would be more productive and controlled if the participants contributed their opinions in groups comprising fewer individuals. Moreover, splitting the participants into two groups ensured that the focus of each group concentrated on one perspective of the co-location construction project performance. This would produce more reliable responses.

The performance perspectives, dimensions, criteria and measures of the overall conceptual framework were explained to participants to prepare them for the second part of the session which focused on identifying the level of perceived importance of the performance measures according to the participant's expertise and their roles in managing the FE/HE co-location project. Thus, the participants were then asked to rank

the performance measures, presented to them in each group, according to their perceived importance in achieving co-location project success. The ranking scale consisted of high, medium and low categories. The participants wrote their responses beside each performance measure in focus.

At the end of the workshop, the notes made by the participants were collected and consequently, data gathered in the session were reviewed and analysed as presented in the next section.

6.2.4 Focus Group Analysis and Results

In the first part of the workshop which focused on identifying top five performance measures that characterise successful FE/HE co-location project, the participants responded with descriptive responses. The descriptive data collected were analysed using content analysis method. In this method, the content of the contributions of participants are studied in that the meaning and specific inferences that relate to the research problem are highlighted (Stewart *et al.*, 2006, p.117). In other words, themes that appear to be developed by the participants in their responses are identified. Those themes can be analysed using three methods (Kumar, 2005, p.223). In the first method, words that exactly match in the responses are collected and integrated in a researcher's study to support or oppose their discussion. The second method suggests that emerged themes are coded and then the frequencies of each coded theme are calculated. A combination of the previous two methods forms the third method of analysis. The researcher used the third method in which the success criteria suggested by the participants in their responses were coded and their frequencies were calculated. Based on this type of analysis, as Tables 6.1a, 6.1b and 6.1c illustrates, there were 36 key words expressed by the participants. These key words were listed and ordered in Table 6.2 according to their frequencies.

It can be seen from the table that construction duration, cost, quality of the constructed campus, FE/HE working collaboratively, student and staff satisfaction were mentioned the most by the respondents. This result corresponds to success criteria mentioned constantly in the literature such as Ashley *et al.* (1987), Pinto and Slevin (1988), Kumaraswamy and Thorpe (1996) and Kerzner (2009). These criteria reflect project

management success according to de Witt (1988), project efficiency as per criteria recommended by Shenhar *et al.* (1997), the “micro perspective” according to the success classifications of Lim and Mohamed (1999) and “instant success” based on Pinto (2007)’s success dimensions. Other criteria that were frequently mentioned related to the way the co-located institutions deal with the new allocated space for achieving best value in terms of efficiency, utilisation and flexibility, in addition to transition arrangements, good communication channels and joint administration. The results of the first part of the focus group yield not only performance measures, but also other responses that can be considered as success dimensions because some responses described generic concepts that can include a group of performance measures. This helped in integrating the list of suggested success criteria into the newly developed framework that was modified by the participants in the second part of the focus group workshop.

Role within organisation	Proposed top 5 performance measures
Policy Officer (Funding Organisation)	Best value for public money invested in the project
	HE/FE working collaboratively
	Student recruitment and retention increase
	Development of “Best Practice” for sector to follow
	Improving estate performance and sustainability
Director of Planning (HE)	Completion of construction on time, in budget and to specification
	New facilities favourably viewed by staff and students
	Co-location allows reduced operating costs
	Co-location promotes collaborative working
	Minimum disruption to critical activities during process
Service Director (HE)	Eventual smooth integration of college and university students
	Unified service delivery of entire campus
	Successful transitional arrangements (i.e. library, catering) during main campus building phase
	Development and implementation of change management programme for HWU staff
	Completion of campus on time

Table 6.1a: Focus Group Responses

Role within organisation	Proposed top 5 performance measures
Project Architect	Flexibility of space
	Space utilisation of post co-location;
	Successful shared services work
	Future adaptation and possible extension
	Maintenance of estate
Assistant Principal (FE)	1. Cost
	a. Funding agreement
	b. Construction project within operating costs
	2. Quality
	a. Facilities
	b. Joint services
	c. Joint curriculum delivery
	3. Time:
	a. Competition as per project plan
	b. Operational agreements delivered within programme
	4. Best value model
	5. Effective transition (Effective communication; perceived satisfaction)
Assistant Director of Estates (HE)	Building quality
	Heating/cooling issues
	Reduced utility costs
	Ease of service
	Efficient use of space

Table 6.1b: Focus Group Responses

Role within organisation	Proposed top 5 performance measures
Project Manager	Efficiencies in the organisational and curricular operation of FE/HE
	Long term savings in the facilities management cost of FE/HE institutions' estate
	Delivery of the project within the approved budget
	Delivery of the new campus within the desired timeframe
	Provision of a campus which meets the needs and improves the quality of occupation and education for FE/HE institutions
HWU Consultant (Co-location Chartered Surveyor)	How can we measure the success of two student groups using the building (high usage of space, communication)?
	Can staff and students satisfactorily adjust to smaller amount of space (staff and students adjusting to smaller space)?
	Will the revised space successfully allow education to continue (teaching delivery within designed space)
	Staff perceive the co-location as a positive more rather than a take over (trust, acceptance and involvement)
	FE/HE institutions will continue to grow successfully in view of lifted student no's and how this is managed in the foot print provided (facility meets changing future demands)?

Table 6.1c: Focus Group Responses

Performance measures	Frequencies
Construction time	4
Construction quality (Building)	4
Working collaboratively	4
Student satisfaction	4
Staff satisfaction	3
Construction cost	3
Long term cost savings	2
Best value	2
Transition	2
Space flexibility	2
Space utilisation	2
Space efficiency	2
Agreements (administration)	2
Communication	2
Student recruitment	2
Student retention	1
Best practice	1
Construction quality (Service)	1
Estates performance	1
Sustainability	1
Heating/cooling	1
Promoting co-location strength	1
Continuity of educational activities	1
Integration	1
Procurement	1
Change management	1
Space functionality	1
Estates costs	1
Utility costs	1
Facilities management costs	1
Joint curriculum delivery	1
Satisfaction	1
Satisfaction with services	1
Meet the needs	1
Efficiency	1
Trust	1
Involvement	1

Table 6.2: Frequencies of Identified Performance Measures

The second part of the focus group workshop concentrated on ranking the performance measures of the overall conceptual framework in both performance perspectives on the basis of their importance in determining the success of FE/HE co-location project. When dealing with the measures in the performance drivers perspective, the respondents

demonstrated emphasis on measures related mainly to the co-location construction project's time, cost, quality of the construction service, satisfaction, administration and operation in addition to governance and management (table 6.3a). Within performance drivers of FE/HE co-location construction projects, two main criteria, safety and construction productivity, were dropped as the performance measures they presented showed “medium” importance in determining the project success. This indicates that the respondents showed that they agree with the majority of the criteria presented in the overall conceptual framework. The opinions of participants towards the measures that represent performance results perspective showed some differences from the proposed overall conceptual framework. Their responses demonstrated that the performance measures related to financial, asset usage, construction product quality, institutions image and environmental impact are of “high” importance in determining the success of FE/HE co-location projects (Table 6.3b). Measures linked to the criteria of costs of human resources, social impact and economic impact were explained as of “medium” or “low” importance to the success of such projects.

The identified themes of success criteria together with the high importance performance measures were integrated into an overall conceptual framework that focuses on measuring the performance of FE/HE co-location projects (Tables 6.4a and 6.4b).

It is worth noting that the newly revised framework shows that the participants suggested a number of success criteria and performance measures that were highlighted and presented in the measurement framework provided to the participants at the second part of the focus group workshop. However, the emerged framework included some success criteria that were not captured in the original framework. These criteria and measures focus on aspects of transition and change management in addition to collaborative working between the co-located institutions.

Performance perspectives	Construction project stages	Project success dimensions	Project success criteria	Performance measures	Rank
Performance drivers	Delivery stage	Project efficiency	Time	Construction time	H
			Cost	Construction cost	H
				Life cycle cost	H
			Quality	Quality (Construction service)	H
			Safety	Accident Incident Rate (AIR)	M
				Accident Frequency Rate (AIR)	M
				Lost Time Injuries (LTI)	L
			Satisfaction	Customer satisfaction	H
				Team satisfaction	M
			Productivity	Productivity of construction work	M
		Impact on customer	Customer	Absence of problem	M
				Library and information services	M
				Continuity of educational activities	H
			Administration and operations	High quality service process (administration)	H
				Teaching facilities	M
				Teaching quality	H
				Resource-input	M
		Preparing for the future	Governance and management	Knowledge transfer and relationships (articulation)	H
				Staff quality	H
				Staff and human resource development	H

Table 6.3a: Ranking of the Proposed Performance Drivers Measures

Performance perspectives	Construction project stages	Project success dimensions	Project success criteria	Performance measures	Rank
Performance results	Post delivery stage	Financial, states and infrastructure	Financial	Cost effectiveness Space productivity	H H
			Human resource cost	Human resource cost	M
			Asset usage	Space efficiency	H
				End user satisfaction with the shared facilities	H
				End user satisfaction with the shared space	H
			Quality (product)	Quality (Construction product)	H
				Customer satisfaction (product)	H
		External impact	Institutions image	Student recruitment	H
				Student retention	H
				Student achievement	H
				Students' satisfaction	H
				Public service/outreach	M
		Sustainability	Environmental impact	Energy	H
				Water	H
				Waste/materials recycling	M
				Visual impact	M
			Social impact	Cultural heritage	M
				Public access	L
			Economic impact	Employment of labour	L
				Resettling cost of people	L
				Rehabilitating cost of ecosystem	M
				Supplier satisfaction	L
				Recurring business	L

Table 6.3b: Ranking of the Proposed Performance Results Measures

Performance perspectives	Construction project stages	Project performance dimensions	Construction project success criteria	Proposed performance indicators/outcomes
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Performance drivers	Delivery stage	Project efficiency	Time	Construction time
			Cost	Construction cost Life cycle cost
			Quality	Quality (Construction service)
			Satisfaction	Customer Satisfaction (service)
		Impact on customer	Customer	Meet needs for education Continuity of educational activities
			Integration	Promoting co-location strength Procurement and service delivery
			Change/transition arrangements	Involvement (Staff buy in) Effective communication Trust building
			Administration and operations	High quality service process (administration) Teaching and academic quality
		Preparing for the future	Governance and management	Knowledge transfer and relationships (articulation) Staff and human resource development

Table 6.4a: Emerged performance measurement framework (Performance drivers perspective)

Performance perspectives	Construction project stages	Project performance dimensions	Construction project success criteria	Proposed performance indicators/outcomes
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Performance results	Post-delivery stage	Financial, states and infrastructure	Financial	Cost effectiveness Space productivity
			Asset usage	Space efficiency Satisfaction with shared facilities and services Satisfaction with the shared space
			Quality (product)	Quality (Construction product)
		External impact	Institution image	Student recruitment Student retention Student achievement Student satisfaction
		Sustainability	Environmental impact	Energy consumption Water consumption

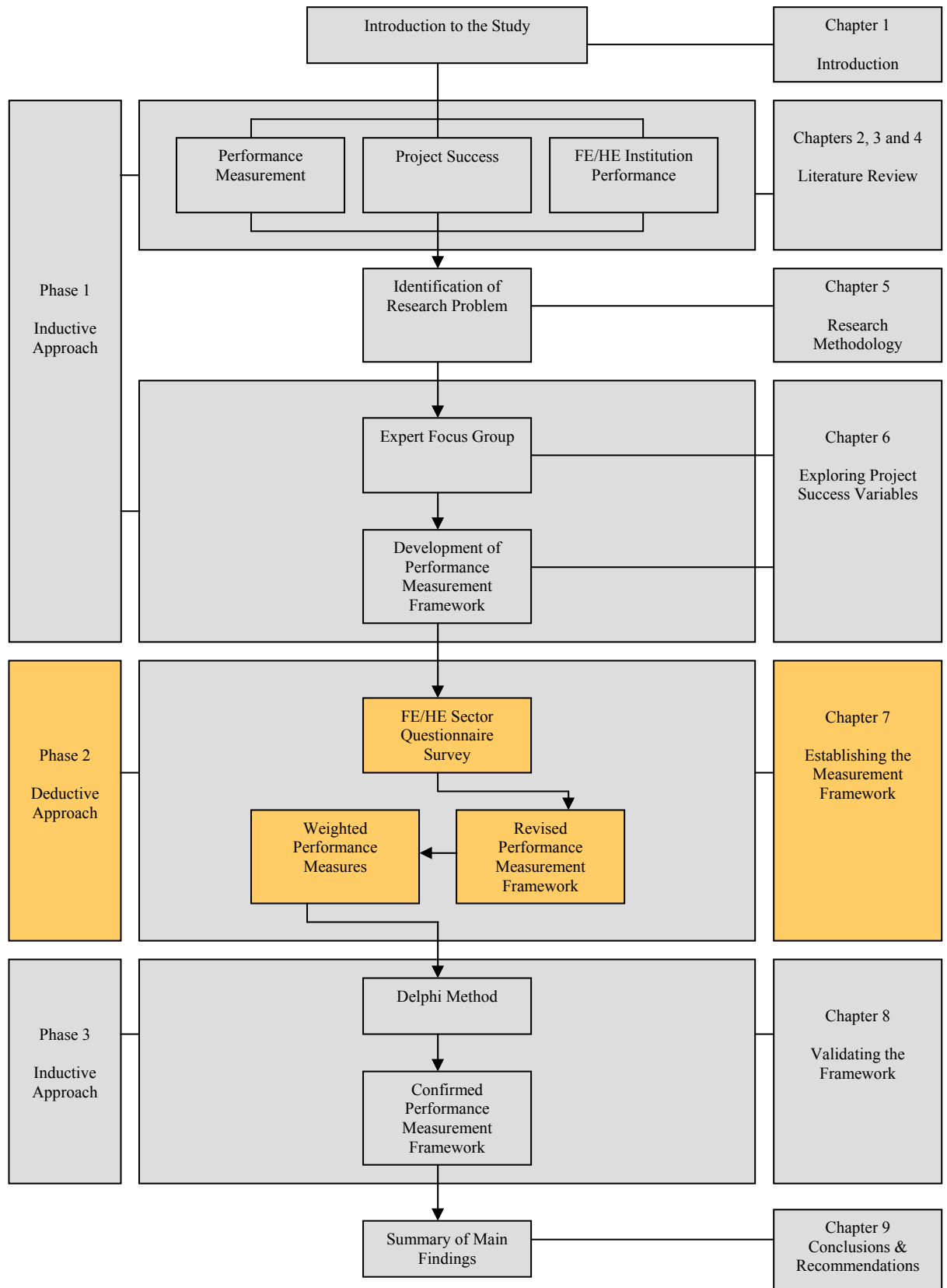
Table 6.4b: Emerged Performance Measurement Framework (Performance Results Perspective)

6.3 Conclusion

Addressing the research aim started through a literature review which assisted in forming a conceptual measurement framework for construction projects that facilitates general education projects. To narrow this wider framework and make it specific to FE/HE co-location projects, a focus group workshop was undertaken which included specialists in this subject. The developed framework was then presented to a wider sample to include their opinions about what characterise successful FE/HE co-location project.

This chapter presented the development of the overall conceptual framework for measuring the performance of FE/HE co-location construction projects. The development process utilised the focus group method as a preliminary step in the study to explore, gain more understanding and insights of performance criteria that characterise successful FE/HE co-location construction projects. The participants of the focus group workshop demonstrated that the overall conceptual performance measurement framework, that integrates construction project success dimensions, criteria and corresponding measures captured in Chapter 3 and performance measurement dimensions, criteria and measures of further and higher educational institutions highlighted in Chapter 4, is feasible by confirming its hierarchal structure. However, the participants identified additional success criteria and performance measures which were integrated into the proposed framework to conclude with a modified edition of an overall framework for measuring the performance of FE/HE co-location construction projects. This modified framework will be tested by a wider sector-level sample using a questionnaire survey to confirm that findings obtained at this phase of the research.

Chapter 7: Establishing the Measurement Framework



Chapter 7 Establishing the Measurement Framework

7.1 Introduction

In the previous chapter, the initial synthesis of the performance measurement framework from literature was further refined using a focus group workshop. Using focus groups has been traditionally dealt with by researchers as an initial step that requires verification by other research methods (Morgan, 1997 p18). The Focus group assists in gaining broader knowledge of a new area and provides a foundation for using other research methods such as survey questionnaires to further develop the research study (Langford and McDonagh, 2002, p2). Moreover, focus groups usually generate hypotheses which, in turn, require verification through the use of quantitative research techniques such as questionnaires (Edmunds, 2000, p4)

Kumar (2005, p126) defined a questionnaire as “*a written list of questions, the answers to which are recorded by respondents.*” Questionnaires offer a standardised way of asking questions to all members of a research sample (Brace, 2008, p4). The term ‘sample’ has the meaning of an example or portion from a larger ‘population’ which is taken from that ‘population’ to illustrate what the remaining is like (Naoum, 2006, p59). Therefore, the aim of gathering data from a sample is to allow the researcher to generalise findings and generate statements about the whole population that the sample was taken from (Easterby-Smith *et. al*, 2008, p212).

This chapter, based on the reasons mentioned above, will use focus group findings to design a survey questionnaire to verify the performance measurement framework from the previous phase of the study. The questionnaire will use the performance measures of the two project performance perspectives, performance drivers and performance results, to establish the framework structure depending on the opinion of a larger sample. In addition, the data gathered by the questionnaire will be statistically analysed to uncover the performance dimensions in each perspective of the overall project performance providing a higher level performance dashboard for senior management to oversee the overall performance of the co-location project.

7.2 Questionnaire Sample

The representativeness of the findings generated on the basis of the data collected from a certain sample relies on the extent to which the characteristics of the sample match those of the population (Easterby-Smith *et al.*, 2008, p212). The population in this study represented people who were chosen on the basis of their professional roles within their organisations. They held positions that are equivalent to those who were involved in managing the FE/HE co-location project in Galashiels at the Scottish Borders; the live co-location project from which the FE/HE co-location success dimensions, criteria and performance measures were elicited. However, the fact that the majority of the respondents might not have experience of co-location projects specifically has been considered. The questionnaire collected different views and perspectives from the respondents based on opinions, informed by their experiences in providing FE/HE educational and estate services to define the overall success of FE/HE co-location projects. It is important to note that the questionnaire sample in this study matched the questionnaire population.

7.3 Questionnaire Design

The aim of questionnaire design is to find answers to the research questions by collecting valid data from appropriately chosen participants (Azzara, 2010, p18).

Hayes (2000, p73) asserted that there are a number of different stages required to produce a competent questionnaire. These stages are:

- Identifying the objectives of the questionnaire
- Choosing suitable questions
- Piloting the questionnaire
- Revising the questionnaire
- Administering the questionnaire
- Analysing collected data
- Reporting the study

7.3.1 Objectives of the Questionnaire

The objectives of the questionnaire survey as data collection technique in this study were:

- to explore the opinion of a wider sector of further and higher education, as potential clients of developing and constructing co-location campuses, regarding the characteristics of successful co-location projects;
- to establish the measurement framework structure of the FE/HE co-location project performance in accordance with the analysed data
- to indirectly test the measurement framework of FE/HE co-located projects developed by preceding exploratory focus group; and
- to use the outcomes in aggregating the different levels of performance perspectives, dimensions, and measures.

7.3.2 Choosing Suitable Questions

McCormack and Hill (1997, p69) identified three styles of questions that form the basis of a conducted survey. These styles are:

- Behavioural questions which are used to explore the way the respondents act
- Attitudinal questions which are used to explore the way respondents think
- Classification questions which are used to explore who the respondents are

The objectives of the questionnaire inform whether behavioural, attitudinal or both types need to be used in combination with classification questions to collect the required data (McCormack and Hill, 1997, p70). According to the objectives of this study and the purpose of this questionnaire, the styles of questions used were classification and attitudinal questions.

Attitudinal questions provide statements to which respondents answer according by stating what they think about those statements. In this regard, Kumar (2005, p151) suggested that attitudinal questions can be measured using ordinal scales, such as Likert scales, which are used to order, sequence or rank collected data in a meaningful manner (Crowther and Lancaster, 2008, p154). However, it is worth noting that scaled and ranking questions, which use ordinal data, can be used to deal with interval data in

situations where categories have the same distances between them (McCormack and Hill, 1997, p124).

When using the Likert scale, the researcher designs the questions to include attitudinal statements, related to the subject in focus, that range between two extremes that represent agreement or disagreement with those statements (Naoum, 2006, p79; Hayes, 2000, p93). In addition, the researcher usually includes either categories or numbers in the scale to mark the range between the two extremes of the Likert scale (Kumar, 2005, p147). Moreover, one of the features of this scale is that it has a 'neutral mid-point' to give the respondents, who do not have a particular view regarding the subject on focus, the chance to express their choice. In the current survey, this issue was dealt with by adding an extra choice, labelled as 'do not know', so that the respondents can directly state if they do not have opinion about a particular statement that describes one characteristic of co-location project success.

Another feature of the Likert scale is that it has been developed on the basis of five point scale (Easterby-Smith *et al.*, 2008, p230). Researchers can expand beyond the five-point scale to a larger scale such as a ten-point scale in situations where a level of accurate answer is required (Cohen, 2007, p327). However, the current research adopted a ten-point scale as the intention was to collect as accurate data as possible from the respondents in such case the gathered data will be analysed using statistical software such as factor analysis. In addition, the researcher used an even number to determine the scale categories instead of the conventional odd number because respondents show a tendency for choosing the middle point in an odd Likert scale (Cohen, 2007, p327). Besides, respondents who do not have a precise view on a certain issue may opt to choose the extra choice (i.e. 'do not know' choice) provided in the questionnaire.

7.3.3 Piloting and Revising the Questionnaire

Before distributing the questionnaire to the prospective subjects, it has to be pilot tested (Saunders, 2009, p394). Piloting the questionnaire is a test that enables the researcher to test the questionnaire function and figure out if the questionnaire has been dealt with and responded to properly (Hayes, 2000, p75). In other words, the aim of this exercise is to improve the questionnaire in such away that respondents with the questionnaire will

not find difficulties in responding to it and the researcher will not face problems in collecting the required data (Saunders, 2009, p394).

The number of respondents needed for pilot testing the questionnaire, according to Fink (2003, p108), is set to be ten or more. In this research, the number of people that the questionnaire was piloted with was eleven representing two organisations; one FE institution (Borders College or BC) and one HE institution (Heriot Watt University or HWU). These two institutions are currently sharing one campus as part of a co-location project for the purpose of effective and efficient provision of high quality further and higher education in the Scottish Borders region. In addition to the HWU and BC co-location project manager and the consultant for that project, the questionnaire was piloted by people who directed the co-location project process between the two institutions. These people held the following positions within both FE and HE institutions; Director of Campus Services, Director of Estates, Director of Finance, Director of Planning, Principal and Assistant Principal. In addition, the pilot questionnaire was also sent to the Assistant Director of Capital Projects and two policy officers in the Scottish Funding Council, the funding organisation involved in the above mentioned co-location project. The pilot questionnaire was sent to these respondents by email (Appendix A).

Piloting the questionnaire revealed that changes were needed in response to comments received. The respondents expressed that the questionnaire took longer time to complete than expected. Respondents had to read a definition and brief description of each performance measure. Those performance measures needed to be ranked according to their importance in characterising the success of co-location projects. This question format gave the respondents a comprehensive picture of each performance measure, helping the respondents to have a better chance to answer the questions because understand them. However, the lengthy explanation of the questions meant that some respondents couldn't maintain their attention towards the end of the questionnaire. Brace (2008, p164) suggested that when the attention of people responding to a questionnaire is lost, the quality of the data must be questioned. Therefore, alterations and adjustments were made to the questionnaire in that the statements became shorter and clearer.

7.3.4 Administering the Questionnaire

Kumar (2005, p129) identified “the mailed questionnaire” as the most common method for gathering data using the questionnaire technique. This research, however, used the electronic mail method whereby a web link to the questionnaire and a cover letter are posted to a list of respondents’ email addresses (Saunders, 2009, p395). Before sending the questionnaire out to the respondents, a ‘pre-survey contact’ (Saunders, 2009, p397) was made by the Scottish Funding Council (SFC), the sponsors of this study, advising sample members to expect a questionnaire. The aim of this ‘pre-survey contact’ was to encourage participation and to ensure a suitable level of response. In addition, a follow-up email to all respondents was sent a week after sending the questionnaire to thank people who had already participated and remind others to participate (Saunders, 2009, p398). Another follow up email was sent one week before the deadline for receiving the completed questionnaires.

The questionnaire was emailed to management staff of all further and higher education institutions in Scotland. The questionnaire covered the proposed performance measures of the two performance perspectives; performance drivers and performance results generated through the literature review stage and refined by the focus group workshop. However, the performance measures were mixed in the questionnaire so that the respondent would not be confused by the two parts of the overall project performance. The questionnaire included four sections (Appendix B). In the first section, the respondents needed to answer the questions with categorical data about who they were. The second section of the questionnaire aimed at assessing the extent to which each performance measure can be used to characterise the success of a co-location campus. Responses were sought on ten-point Likert scale where statements were measured from 1 to 10 (1= Strongly disagree, 10= Strongly agree). The third section included an open question that gave the respondents an opportunity to state their opinions about the performance measures. The last section asked the participants to give their contact details in should they prefer to be provided with a summary of the questionnaire outcomes.

The data collected were to be analysed using factor analysis. This analysis investigates common attributes a group of variables has and therefore decreases the number of variables to a few constructs or factors. However, factor analysis does not examine

influence or explanation. It is concerned with the relationships between a number of variables in one group (Blaikie, 2003). The aim of using this technique was to identify the underlying components that express the relationships among the performance measures, and examine the relationship between each group of performance measures. Factor analysis was also used to provide factor weightings, which is particularly important in this study as they can be used in aggregating the different groups of performance measures into single indexes.

7.4 Questionnaire Results

The questionnaire was distributed to a population of 317 people. The total respondents were 90 people. Accordingly, the response rate was 28% of the targeted population. From those who responded to the online questionnaire, only 73 people totally completed them which form 82% of total responses. Respondents from further education (FE) were 39 people representing 43% of total responses. Respondents from higher education (HE) were 34 people who represented 38% of total responses. Other respondents were 17 people. They represent 19% of total responses.

7.4.1 Data Analysis

The data collected were analysed using factor analysis. Factor analysis (FA) is a statistical analysis method used to ‘reduce’ or ‘summarise’ large database into a smaller group of factors or components (Pallant, 2005). Factor analysis examines the relationships between variables in a group and identifies sets of “attitudinal constructs” on the basis of similarity of responses that illustrate “underlying attitudinal dimensions” of the examined variables (Brace, 2004). Kim and Mueller (1997) explained that factor analysis firstly is used to explore the interrelationships between variables in a group; and secondly to examine if the identified interrelationships can be represented by a small number of hypothetical variables.

There are three main reasons for using factor analysis in this research. First, factor analysis has the ability to explore the extent to which a group of variables are describing one underlying “component” (Bryman and Cramer, 2008). Secondly, FA can define the extent to which a case of many variables can be decreased and represented by fewer group of “components” (Field, 2009). Finally, factor analysis can be used as a

weighting technique for aggregating the resulting sets of components into a single index (ESI, 2005, p92).

Factor analysis has two key modes of application that were expressed in the literature. The first is *exploratory* factor analysis, which researchers usually use to investigate collected data to examine the interrelationships among variables. The second is *confirmatory* factor analysis, which is generally used at advanced stages of the research to evaluate particular theories related to the interrelationships among variables (Pallant, 2005). One of the study objectives is to identify the criteria that determine success for FE/HE co-location campus. Therefore, exploratory factor analysis was used to explore correlations among different variables based on the opinions of a sector-level sample.

7.4.2 Steps Involved in Exploratory Factor Analysis of Performance Drivers Measures

Pallant (2005) suggested that performing exploratory factor analysis involves three steps:

1. Assessment of the suitability of the data
2. Factor extraction
3. Factor rotation and interpretation

These steps were followed to perform exploratory factor analysis on two sets of data. The first set included data of performance drivers measures and the second set included data of performance results measures.

The first data set included variables that represent performance drivers measures. They are listed in Table 7.1. The aim of performing exploratory factor analysis on this data set is to uncover the performance dimensions within the performance drivers perspective.

Variable code	Variable title
VAR00001	Effective communication
VAR00002	Staff and human resource development
VAR00003	Minimising disruption during delivery stage
VAR00004	Life cycle costing
VAR00005	Administration process
VAR00006	Trust building
VAR00007	Meeting the needs for educational services
VAR00008	Staff involvement and buy in
VAR00009	Promoting the strengths of the FE/HE co-located institutions
VAR00010	Procurement and delivery service
VAR00011	Academic articulation
VAR00012	Quality of the academic staff
VAR00013	Satisfaction during delivery stage
VAR00014	Construction time
VAR00015	Construction service quality
VAR00016	Construction cost

Table 7.1: Performance Drivers Measures of a FE/HE Co-Location Project

7.4.2.1 Assessment of the Suitability of the Data of Performance Drivers Measures

According to Pallant (2005, 173), sample size and the correlation between variables determine the suitability of a group of variables for factor analysis. Researchers do not have an agreement about the size of a sample required for performing factor analysis, but they do have a consensus that the number of respondents must be greater than the number of variables (Bryman and Cramer, 2008). Gorsuch (1983, p148) asserted that claiming statistical significance of the analysis and its resulting factors depends on the number of respondents with a “large number” being preferred by factor analysts. He further suggested that the “large number” could be between five to ten times the number of variables with a minimum respondents of more than a hundred. This data set was produced by a sample size of 90 respondents. This was less than the minimum number of respondents recommended by (Gorsuch, 1983).

The reliability of the components resulting from factor analysis relies on sample size (Bryman and Cramer, 2008). Although authors did not show agreement on what the size of a sample should be, the advice is: the larger the better (Pallant, 2005, p174). Because the sample size was small (i.e. less than 100 subjects), additional statistical tests were needed to verify the reliability of the results (Gorsuch, 1983, p148). These two tests are the Kaiser-Meyer-Olkin (KMO) test of sampling adequacy and Bartlett’s test of sphericity (Pallant, 2005, p174). The first test is used to determine if the variables in a sample are sufficient to correlate (Hinton *et al.*, 2004, p349). Usually, a KMO value,

which has a range between 0 and 1, is required to be larger than 0.5 in order for an appropriate factor analysis to be carried out (Field, 2009, p647). The second test identifies if there is a high level of correlation between any two variables (Janssens *et al.*, 2008, p255). Bartlett's test of sphericity measures the null hypothesis that the correlation matrix is an identity matrix (Field, 2009, p660). In an identity matrix, correlation coefficients among the variables will be zero. Hence, the test should be *significant* (Field, 2009, p660). This can be identified by undertaking a significance test. Consequently, sample data are considered suitable if Bartlett's test of sphericity is significant ($p < .05$) (Pallant, 2005).

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.800
Bartlett's Test of Sphericity	Approx. Chi-Square	629.976
	df	120
	Sig.	.000

Table 7.2: Suitability of data of performance drivers measures for factor analysis

Based on the above discussion, Kaiser-Meyer-Olkin Measure of Sampling Adequacy for performance measures of the performance drivers perspective needs to be greater than (0.5). Table 7.2 shows that this indicator is 0.8 which is greater than the stated value. This means that the data collected regarding the performance drivers measures are suitable for factor analysis. Table 7.2 also shows that Bartlett's Test of Sphericity is significant ($p < .05$). Therefore, data are appropriate for factor analysis.

7.4.2.2 Factor Extraction

Factor extraction attempts to identify a number of components that are the least possible representation of the interrelations among a group of variables (field, 2009, p660). In this research, the extraction technique that was used is "principal component analysis" which is widely used among researchers (Pallant, 2005, p175). In this technique, the first extracted component explains the greatest sum of variance among the variables. The second component comprises second largest sum of variance that is independent from the first component and so on (Bryman and Cramer, 2008).

Brown (2006) noted two methods that help in determining the number of components that need to be maintained. These methods are:

- The Kaiser-Guttman rule; and
- The Scree test

7.4.2.2.1 Kaiser-Guttman Rule

This method of extracting the underlying components is widely used in research because it ensures that only components that have a certain eigenvalue that are equal or greater than a selected value are maintained (Field, 2009). SPSS by default keep the components that have eigenvalues larger than 1. To quote from Pallant (2005, p175), “the eigenvalue of a factor represents the amount of the total variance explained by that factor”. The Kaiser-Guttman rule is, however, criticised because it often retains too many factors (Pallant, 2005, p175).

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.252	51.577	51.577	8.252	51.577	51.577	3.732	23.327	23.327
2	1.664	10.399	61.976	1.664	10.399	61.976	3.287	20.541	43.869
3	1.340	8.376	70.353	1.340	8.376	70.353	3.227	20.169	64.038
4	1.001	6.256	76.609	1.001	6.256	76.609	2.011	12.571	76.609
5	0.777	4.857	81.466						
6	0.680	4.248	85.713						
7	0.653	4.081	89.794						
8	0.407	2.541	92.335						
9	0.336	2.099	94.434						
10	0.268	1.676	96.110						
11	0.178	1.111	97.221						
12	0.141	0.882	98.103						
13	0.122	0.765	98.868						
14	0.083	0.516	99.384						
15	0.061	0.380	99.764						
16	0.038	0.236	100						
Extraction Method: Principal Component Analysis.									

Table 7.3: Factor extraction of performance drivers measures

Using the Kaiser-Guttman rule revealed that there are four underlying principal components for the 16 performance drivers measures (Table 6.3). These four

components account for more than 76% of the variation in the data whereas the rest of the components account for smaller amount of the variance. As the Kaiser criterion was kept the same as the SPSS default of keeping components that have eigenvalues over 1, the software retained four underlying components.

7.4.2.2.2 Scree Test

The decision on the number of components (factors) to keep can be supported by a method called the Cattell scree test which comprises of plotting a diagram that has two axes representing the components on the (x) axis and their corresponding eigenvalues on the (y) axis (Field, 2009). The diagram will have a curve that is characterised by a significant drop followed by a nearly flat line. The number of components to retain is identified by the cut-off point at which the curve changes its shape (Field, 2009). Consequently, the components with the largest eigenvalues are retained because they account for the majority of the variance explained by the variables (Pallant, 2005).

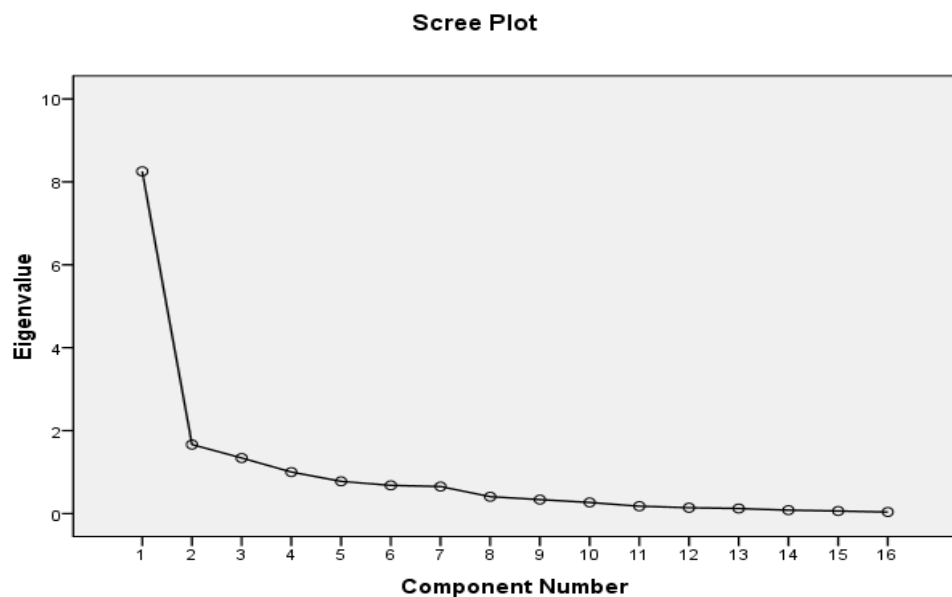


Figure 7.1: Scree Plot of the Performance Drivers Components

Figure 7.2 illustrates the scree plot produced for the data of the performance drivers measures by graphing the eigenvalues. It shows the cut-off point at which the curve becomes more of a horizontal shape. This means that components that are above this cut-off point could be retained. However, this plotted diagram is difficult to explain because the curve changes its shape and drops again at component number 7 before it

becomes nearly flat again. This means that there could be seven components to retain. Another analysis was run with the intention that the statistical software retains 7 components and the result was that four components of the seven components include just one variable. Therefore, the number of components retained was determined on the basis of the four components resulted in the first attempt, which matches the number of components resulting from the Kaiser-Guttman rule.

7.4.2.3 Factor Rotation and Interpretation

Following the extraction of the four underlying components (factors), it is noticeable that the majority of the variables load mainly on one of the factors, which is in this case the first component (Field, 2009). This does not allow proper interpretation of the extracted components to be made. Therefore, additional analysis is required to separate the extracted components by “rotating” them (Field, 2009).

Factor rotation assists in revealing the pattern of loadings of the variables on extracted components in such a way that makes the components simpler to interpret (Pallant, 2005). Rotation can be performed by using one of these two methods (*orthogonal* and *oblique*). Using the *orthogonal* method, the extracted components are rotated in such a way that maintains their independent (Field, 2009, p642). In SPSS, the statistical software used in this study, there are three of *orthogonal* rotation (*varimax*, *quartimax* and *equamax*) (Field, 2009, p644). Pallant (2005) found that the *Varimax* technique is generally used in SPSS within the *orthogonal* rotation. This technique tries to reduce the number of variables that possess high loadings on every component.

The *oblique* method has the meaning of correlated. Using this method, rotation permits correlation between the underlying components. Field (2009, p643) stated that *oblique* rotation is used in the case that the correlation between the components is justifiable on theoretical basis. SPSS has two techniques of *oblique* rotation (*Direct Oblimin* and *promax*). The technique that is used most often along with the oblique method is the Direct Oblimin (Pallant, 2005).

Researchers may perform both methods of rotation and adopt the one that presents the clearest results and the most simple to interpret (Pallant, 2005). However, selecting

which rotation method relies on a sound theoretical reason indicating that the underlying components are necessarily correlated or independent (Field, 2009, p643). The rotation method used in this study is the *orthogonal* rotation because the resulting underlying components are supposed to be independent. For better interpretation of the component matrix, a Varimax rotation was used. This technique rotates the extracted components in a way that makes the loadings of each performance driver's measure has a maximum value on no more than one of the four components. The results of the rotated component matrix are expressed in table 7.4.

Rotated Component Matrix ^a				
Variable	Component			
	1	2	3	4
Construction cost	0.868			
Construction time	0.868			
Construction service quality	0.827			
Procurement and delivery service	0.636			
Administration process		0.844		
Life cycle costing		0.727		
Trust building		0.684		
Staff and human resource development		0.630		
Quality of the academic staff		0.525		
Academic articulation			0.909	
Effective communication			0.779	
Meeting the needs for educational services			0.661	
Promoting the strengths of the FE/HE co-located institutions			0.500	
Minimising disruption during delivery stage				0.811
Satisfaction during delivery stage				0.609
Staff involvement and buy in				0.579

Table 7.4: Rotated Component Matrix of Project Performance Drivers Measures

Table 7.4 explains the component matrix after rotation. The table includes the variables that represent performance drivers' measures and their corresponding loadings on each of the four components. It is important to note that loadings that are less than 0.5 were suppressed for easier interpretation purposes after components rotation, recognising that a number of loadings that were omitted might be significant. Nonetheless, according to Field (2009, p666) "*significance itself is not important*". This explains the reason why there are many spaces that were left blank.

7.4.2.4 Interpretation of Factors

The following stage is to infer the thematic alignment of the performance drivers measures that have high loadings on each component by looking at their definition and the context of those indicators. The four components of the project performance drivers' are listed in Table 7.5.

<p>Component 1</p> <p>“Collaborative building development”</p>	<p>Construction cost</p> <p>Construction time</p> <p>Construction service quality</p> <p>Procurement and delivery service</p>
<p>Component 2</p> <p>“Collaborative institutional management”</p>	<p>Administration process</p> <p>Life cycle costing</p> <p>Trust building</p> <p>Staff and human resource development</p> <p>Teaching skills of the academic staff</p>
<p>Component 3</p> <p>“Sharing educational knowledge”</p>	<p>Academic articulation</p> <p>Effective Communication</p> <p>Meeting the needs of potential applicants for education services</p> <p>Promoting the strengths of co-located institutions</p>
<p>Component 4</p> <p>“Transition administration”</p>	<p>Minimising disruption during delivery stage</p> <p>Satisfaction during delivery stage</p> <p>Staff involvement and buy in</p>

Table 7.5: Components of Project Performance Drivers

The performance measures that loaded largely on component one appeared to have common characteristics that related to the way in which the collaborative FE/HE educational institutions build their shared campus. This component was named “Collaborative building development”.

The next set of the performance measures that have high loading on component two show that they related to the way in which the collaborative FE/HE educational institutions work together to manage their co-located campus. This component can be named “Collaborative institutional management”.

The performance measures with high loadings on component three related to the way in which the collaborative FE/HE educational institutions work together to deliver their business successfully by exchanging knowledge, information and expertise to meet the demands of their students and other stakeholders (see Chapter 3). This component was named “Sharing knowledge”.

The final performance measures that seem to load largely on component four related to the way in which the collaborative FE/HE educational institutions deal with the change that happens as a result to the decision to co-locate with other institutions and during the development and construction process. The four emerged components were considered as performance dimensions within the performance drivers perspective. An illustration of the hierarchy of the performance drivers perspective is shown in Figure 7.2.

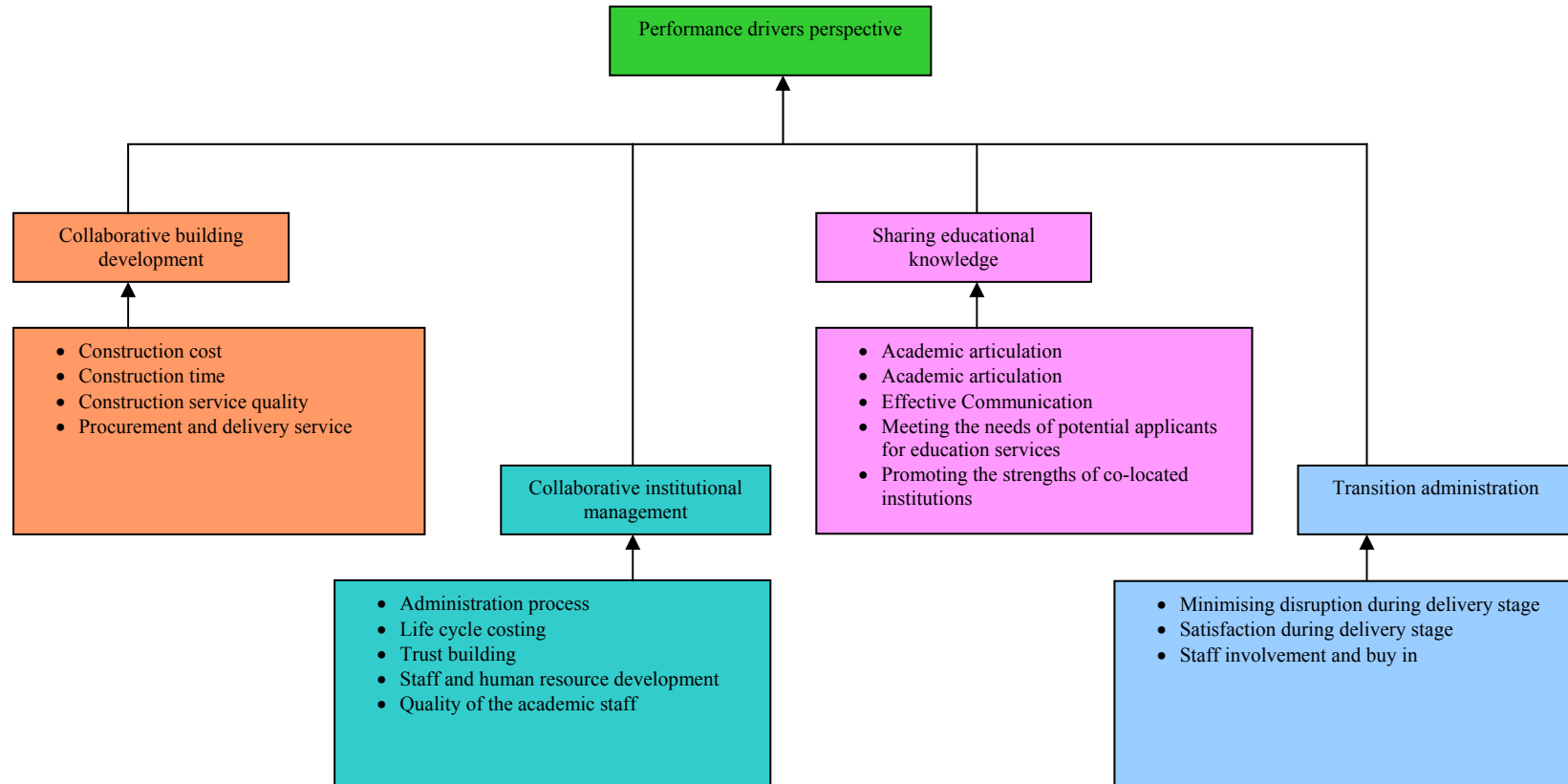


Figure 7.2: Hierarchy of Performance Drivers Perspective

7.4.2.4.1 Collaborative Building Development

This performance dimension focuses on the effectiveness of jointly managing the process of creating the physical products of construction or refurbishment that the co-location institutions require. Fewings (2005, p11) considered that cost, time and specification performance determine the efficiency level of a construction project and assist in controlling it. However, these three measures of performance come second on the client priority list behind the achieving the client's business needs and objectives (Fewings, 2005, p11). This means that the client's needs and wants should be stated and expressed clearly to avoid ambiguity and misinterpretation and adequate way, and then analysed and communicated accurately in order to establish a proper procurement process (Morledge *et al.*, 2006, p34).

7.4.2.4.2 Collaborative Institutional Management

This performance dimension looks at how the co-located institutions manage their shared campus. Management of educational institutions, apart from setting academic objectives and determining the methods to implement and deliver teaching courses and research programmes, depends on dealing effectively with resources such as human and material resources (Daxner, 2010, p22). Collaborative institutional management is crucial because co-location institutions need to work together to deal with their shared activities and services and to establish external collaboration with different parties such as local communities, businesses and enterprises.

7.4.2.4.3 Sharing Educational Knowledge

This performance dimension illustrates how the co-located institutions work collaboratively to create, exchange and apply new and developed knowledge and good practices. Knowledge sharing and transferring between the collocated institutions can take the form of establishing new curriculum or sharing existing ones in addition to preparing and establishing communication and articulation links between them and providing necessary resources to adequately perform this process. Sharing and transferring the knowledge, as applied to a co-location project, involves passing the knowledge from one institution, student or academic staff member to another co-located institution. To succeed in sharing and transferring the knowledge indicates that new

knowledge is created or already existing knowledge are modified in the co-located institutions (Liyanage *et al.*, 2009, p122).

7.4.2.4.4 Transition Administration

This performance dimension concentrates on how effective the co-located institutions are in managing the change driven by the project to co-locate their educational activities, facilities and services. Alexander (2007, p17) asserted the difficulty of the changing nature of higher and further education in terms of responding to the demands imposed by stakeholders. Marks (2007, p721) considered that organisations often opt to use transitions such as mergers, acquisitions and restructurings (or sharing one physical place to collocate their operations) to achieve strategic objectives. Transitions are complex situations to manage because applying change management methods (for instance explaining and populating the objectives and reasons behind the happening change) becomes a difficult task (Marks, 2007, p722).

7.4.3 Steps Involved in Exploratory Factor Analysis of Performance Results

Measures

This data set included variables that represent performance results measures. These variables are listed in Table 7.6. The purpose of performing exploratory factor analysis on this data set is to identify performance dimensions within the performance results perspective.

Variable code	Variable title
VAR00001	Student retention
VAR00002	Student achievements
VAR00003	Student recruitment
VAR00004	Space efficiency
VAR00005	Cost effectiveness
VAR00006	Space productivity (income)
VAR00007	Efficiency of using water
VAR00008	Energy efficiency
VAR00009	Building quality
VAR00010	End users satisfaction with shared space
VAR00011	Student satisfaction with the shared education
VAR00012	End users' satisfaction with the shared facilities

Table 7.6: Performance Results Measures of a FE/HE Co-Location Project

The three steps suggested by Pallant (2005) were also followed on this data set to perform exploratory factor analysis. These three steps were:

7.4.3.1 Assessment of Suitability of Data of Performance Results Measures

The size of the sample used to explore the opinions of the FE/HE institutions about co-location project success characteristics and the correlation between variables determine the suitability of a group of variables for factor analysis. Gorsuch (1983, p148) suggested that there could be between five to ten times the number of variables with a minimum respondents of more than a hundred. However, the sample size for this data set was 90 respondents which was less than the minimum number of respondents recommended by (Gorsuch, 1983). Therefore, additional statistical tests were needed (Gorsuch, 1983, p148). These two tests were the Kaiser-Meyer-Olkin (KMO) test of sampling adequacy and Bartlett's test of sphericity (Pallant, 2005, p174).

The results of both Kaiser-Meyer-Olkin and Bartlett's Test of Sphericity test are presented in Table 7.7.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.820
Bartlett's Test of Sphericity	Approx. Chi-Square	625.461
	df	66
	Sig.	.000

Table 7.7: Suitability of Data of Performance Results Measures for Factor Analysis

According to Field (2009, p659), the Kaiser-Meyer-Olkin Measure of Sampling Adequacy for performance measures of the performance results perspective needs to be greater than 0.5. Table 7.7 shows that this indicator is 0.820 which is greater than the required value. The same table 7.7 shows that Bartlett's Test of Sphericity is significant with ($p < .05$). Therefore, the data of the performance results measures are suitable for exploratory factor analysis.

7.4.3.2 Factor Extraction

The underlying components that are the least possible representation of the interrelations among performance results measures were identified using “principal component analysis” technique. The first extracted component explains the largest sum of variance among the performance results measures. The second component comprises second largest sum of variance and the third component comprises third largest sum of variance.

The methods used to extract components of the performance driver perspective were to identify the components of the performance results perspective. These methods were:

- Kaiser-Guttman rule
- Scree test

7.4.3.2.1 Kaiser-Guttman Rule

This method is used to extract components that have eigenvalues greater than a set up value. The Kaiser criterion was set to keep components that have eigenvalues over 1. Applying this method on this data set revealed that there are three underlying principal components for the 12 performance results measures (Table 7.8). These three components account for more than 81% of the variation in this data set.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.510	54.250	54.250	6.510	54.25	54.250	3.889	32.411	32.411
2	2.008	16.730	70.980	2.008	16.73	70.980	3.492	29.100	61.511
3	1.186	9.887	80.867	1.186	9.887	80.867	2.323	19.356	80.867
4	0.567	4.725	85.592						
5	0.472	3.937	89.528						
6	0.407	3.388	92.917						
7	0.272	2.265	95.182						
8	0.219	1.823	97.005						
9	0.155	1.295	98.300						
10	0.097	0.805	99.105						
11	0.072	0.599	99.704						
12	0.036	0.296	100						

Table 7.8: Factor Extraction of Performance Results Measures

7.4.3.2.2 Scree test

Identifying the appropriate number of components to keep was supported by performing the Cattell scree test which performed by plotting a diagram showing the underlying performance results components on one axis and their corresponding eigenvalues on the axis.

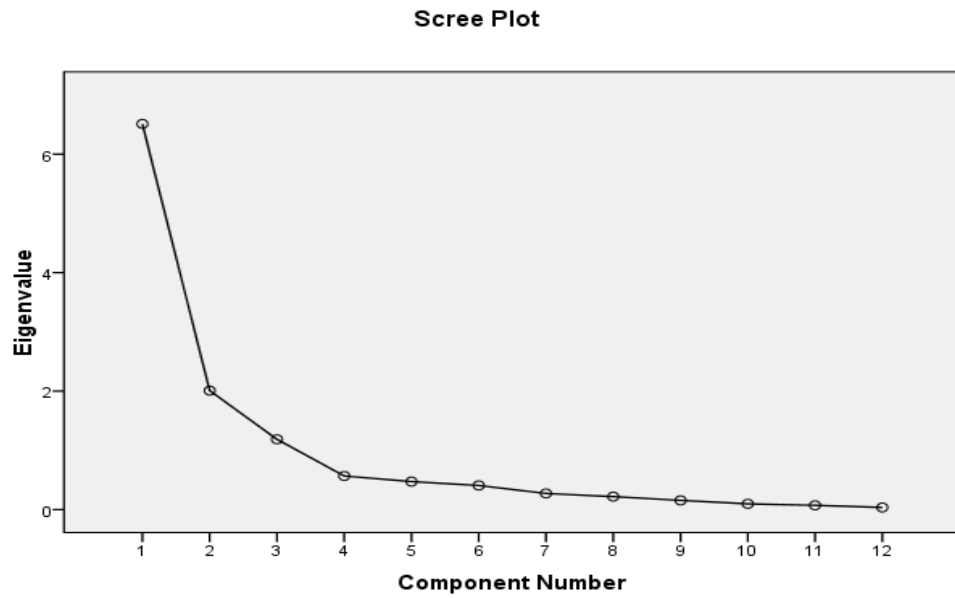


Figure 7.3: Scree plot of the performance results components

Figure 7.3 shows the scree plot produced for the data of the performance results measures. The cut-off point, at which the curve becomes more of a horizontal shape, is shown at component number 4. Components that are above this cut-off point were retained. Therefore, the number of components kept was three, which matches the number of components resulted from the Kaiser-Guttman rule.

7.4.3.3 Factor rotation and interpretation

At this step, factor rotation is used to help in getting better interpretation of the data of the performance results perspective. The rotation method that was used was the *orthogonal* method by which the extracted components are rotated while their independences are maintained based on the assumption that those components are unrelated. In addition, the *Varimax* technique was used within the *orthogonal* method following Pallant's (2005) justification that this technique tries to reduce the number of

variables that possess high loadings on every component. The results of the rotated component matrix are illustrated in table 7.9.

Rotated Component Matrix^a			
Variable	Component		
	1	2	3
Space efficiency	0.848		
Space productivity (income)	0.846		
Cost effectiveness	0.789		
End users satisfaction with the shared facilities	0.778		
End users satisfaction with shared space	0.721		
Building quality	0.612		
Student achievements		0.929	
Student retention		0.897	
Student with the shared education		0.890	
Student recruitment		0.750	
Efficiency of using water			0.940
Energy efficiency			0.912

Table 7.9: Rotated Component Matrix of Project Performance Results Measures

This table includes the variables that represent the performance results measures and their corresponding loadings on each of the three components. It is important to note that loadings that are less than 0.5 were suppressed for easier interpretation purposes after components rotation, recognising that a number of loadings that were omitted might be significant. According to Field (2009, p666) “*significance itself is not important*”. This explains the reason why there are many spaces that were left blank.

7.4.3.4 Interpretation of Factors

Common themes among the performance results measures were identified. In other words, the performance measures which have high loadings on each component will be classified together and interpreted by looking at their definitions and context. The result of the analysis reveals three components (Table 7.10).

The performance outcomes that were loaded greatly on component one share characteristics that related to the physical educational atmosphere within which the co-located institutions provide their services. Consequently, this component was named “Learning built environment”.

Component 1 “Learning built environment”	Space efficiency Space productivity (profitability) Cost effectiveness Satisfaction with the shared facilities Satisfaction with shared space Building quality
Component 2 “Collaborative educational provision”	Student achievements Student retention Satisfaction with the shared education Student recruitment
Component 3 “Co-location sustainability”	Efficiency of using water Energy efficiency

Table 7.10: Components of project performance results

The performance measures that had high loadings on component two, related to the performance of students of the co-located campus. Thus, this component was named “Collaborative educational provision”.

The final set of performance measures loaded largely on component three related to environmental sustainability. This common characteristic may give the reason to label this component as “Co-location sustainability”.

The three components were considered as performance results dimensions. An illustration of the hierarchy of the performance drivers perspective is shown in Figure 7.6.

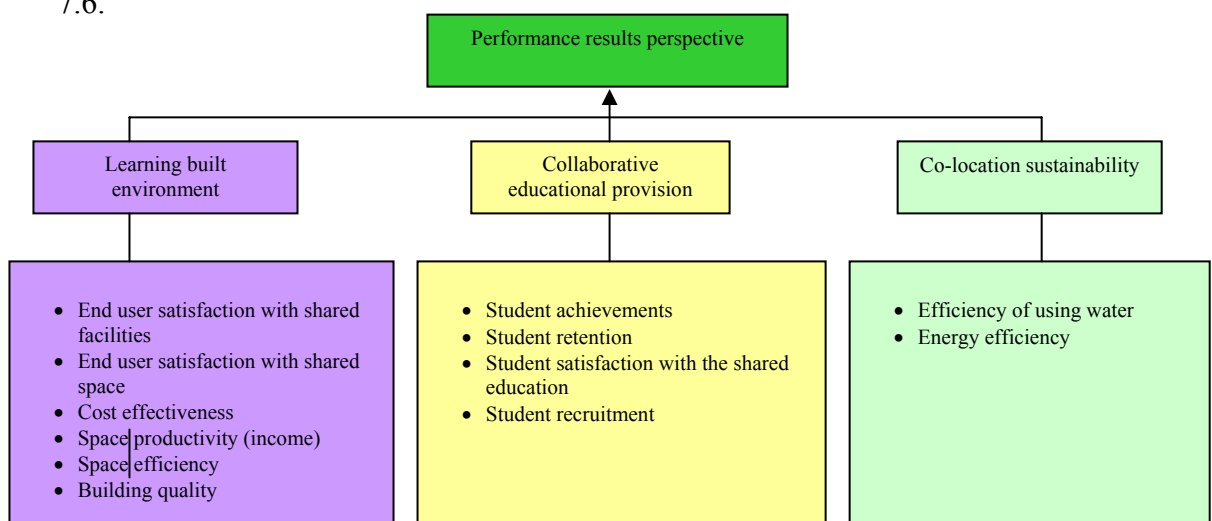


Figure 7.6: Performance Results Dimensions and Their Performance Measures

7.4.3.4.1 Learning Built Environment

This performance dimension focused on the physical learning environment within which teaching, research and other learning activities take place. The importance of this dimension lies in the notion that the learning environment and individual learning processes are interconnected in that the learning environment influences the perception of students and consequently their responses and learning processes (Vermetten *et al.*, 2002, p264). Loughlin and Suina (1982, p2) considered that the physical environment offers the settings of adequate facilities and spaces required to support interactions between students and their surroundings, and establishes satisfactory internal atmosphere in terms of temperature, light and sound.

7.4.3.4.2 Collaborative Educational Provision

This dimension covers the outcomes of providing sufficient and good quality shared teaching, research and learning resources. Collaborative education is a comprehensive term used to express different educational approaches that engage joint academic endeavours between students and academic staff (Smith and MacGregor, 1992, p11). In addition, further and higher education institutions adopt the collaborative approach to encounter problems they face such as the need to increase the student retention rates and improve the quality of educational provision (Smith and MacGregor, 1992, p7).

7.4.3.4.3 Co-location Sustainability

This performance dimension represents the environmental impact of the co-location project on the local community. This includes the consumption of energy resulting from using materials such as fuel for cooling and heating, and transportation in addition to the use of natural resources such water. Kibert, (2007, p108) asserted that sustainable building use renewable energy resources or make better use of available resources to reduce energy consumption, water and materials recycling, innovative methods for heating, cooling and ventilation in addition to other techniques to reduce the environmental impacts and maintain natural resources. The opinion of Gelfand and Freed (2010, p3) is that sustainable applications in educational institutions assist in evaluating and controlling the impacts of energy and resource consumption.

The overall performance measurement framework that includes both performance perspectives was established (Figure 7.7).

Chapter 7: Establishing the Measurement Framework

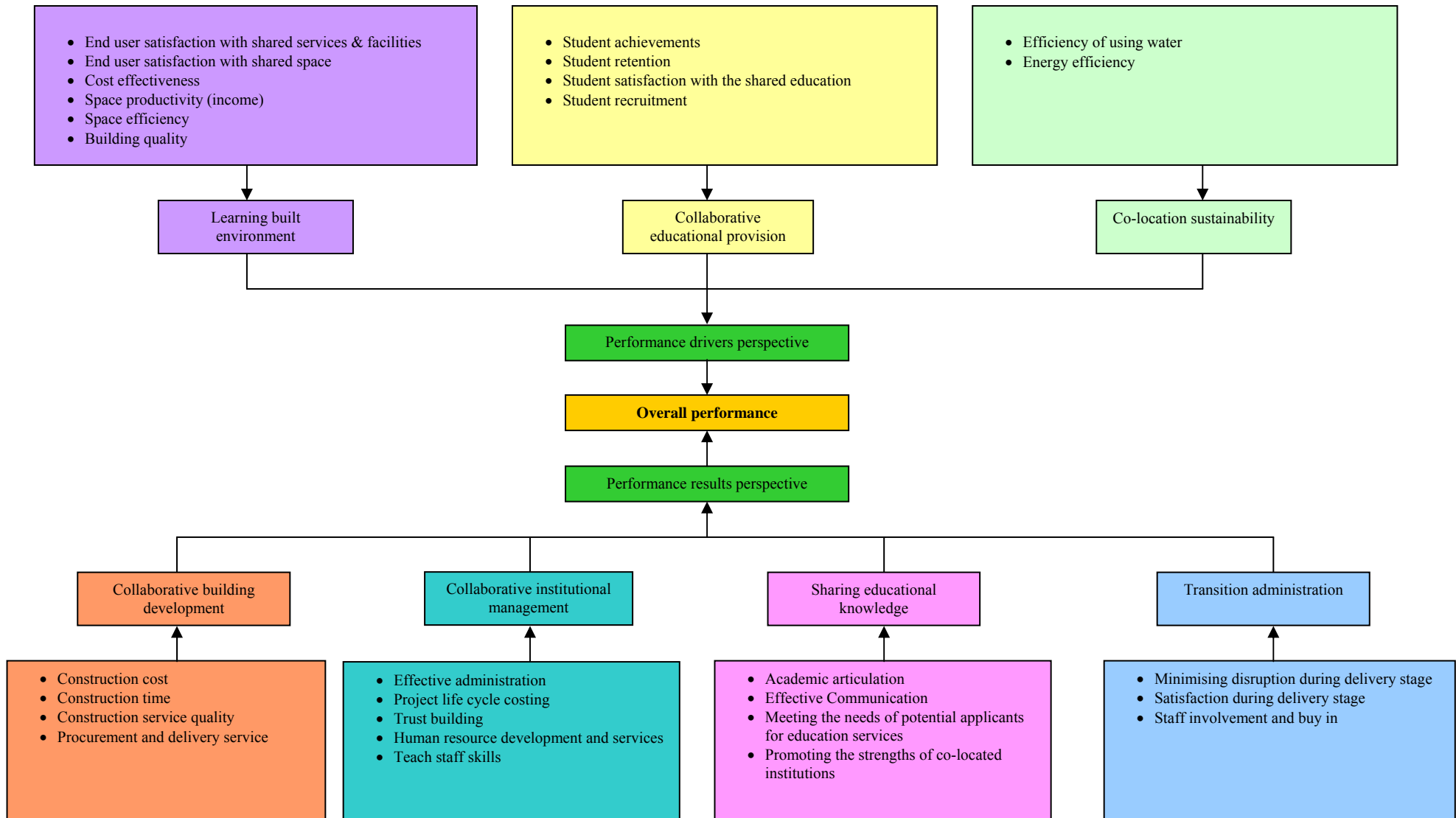


Figure 7.7: The Established Performance Measurement Framework

7.4.4 The Measurement Framework

As illustrated in Figure 7.7, the measurement framework has two distinctive perspectives: performance drivers and performance results, assuming that the project consists of two stages, namely project delivery and post delivery stages. In addition, the framework has three hierarchical levels: overall performance, performance dimensions and performance measures. While the top two levels are for the use of senior management, the third level has been structured for the use of managing the co-location collaborative project activities.

7.4.4.1 Performance Drivers Perspectives

This performance perspective covers one stage of the co-location project which is the project delivery stage. This stage includes project phases from inception up to the point when the constructed campus is handed over to co-located institutions. The performance drivers perspective has four performance dimensions. They were explained earlier. Each dimension consists of a number of performance measures. The performance measures within those dimensions focus on critical aspects of the developing project, which are supposed to improve the future performance of the co-location project at the post-delivery stage when the shared campus is operational.

7.4.4.2 Performance Results

The other perspective of the performance covers the project post-delivery stage. This stage starts when the shared campus is put into operation, and expands till the end of the proposed age of the co-location project. This performance perspective has three dimensions as explained earlier. The performance measures of these dimensions focus on the outcomes of the co-location project. Some of the results may need a few years before they are realised and consequently measured. Therefore, the overall performance of the co-location project is expected to improve through time.

7.4.5 Methods of Measurement

The study sought to develop a method by which the overall performance at different hierarchal levels can be measured. The performance measures in the measurement framework fall into quantitative and qualitative types. The quantitative performance

measures can be directly assessed using numerical values (Chan *et al.*, 2003, p636). Therefore, the quantitative measurement was performed using statistical data related to the co-location institutions such as numbers of students and staff, student performance, and other data related to the construction project such as project duration, costs and quality. These data are available in sources such as Educational Management Statistics (EMS), e-Mandate, Higher Education Statistics Agency (HESA) and the construction project documents of the co-location.

Qualitative performance aspects cannot be measured numerically (Chan *et al.*, 2003, p636). Two ways to assess the qualitative performance were therefore adopted by the measurement framework. The first is using scales such as the Likert scale. This way of assessment was applied to performance measures that are not process based because they relate to assess levels of satisfaction. The second way of assessing the qualitative performance measures was applied to those measures that are process based. This second method of measurement used a five-level set of criteria to represent the lifecycle of a process. It is called a process maturity model (Lockamy III and McCormack, 2004, p272).

Process maturity models normally describe the characteristics of good practice of the area that a performance measure assesses. FE/HE co-location institutions can measure their success using this device. To illustrate, in the academic articulation area, the co-location institutions will try to collaboratively establish academic routes by which students of the FE institution can smoothly progress to the HE institution. If the FE/HE institutions are observed to exhibit criteria that matter one of the five levels in the maturity model, then the performance of the FE/HE institutions is at that level. The maturity model provides a checklist of necessary characteristics of increasingly mature practice. This way of measuring the performance of educational institutions was used by McKinnon *et al.* (2000) to determine performance trends in an educational institution and to promote continuous self-improvement initiatives. Figure 7.8 illustrates the five-level process maturity model that was used to assess the process based qualitative performance measures.

The quantitative and qualitative performance measures are presented in detail in Appendix F.

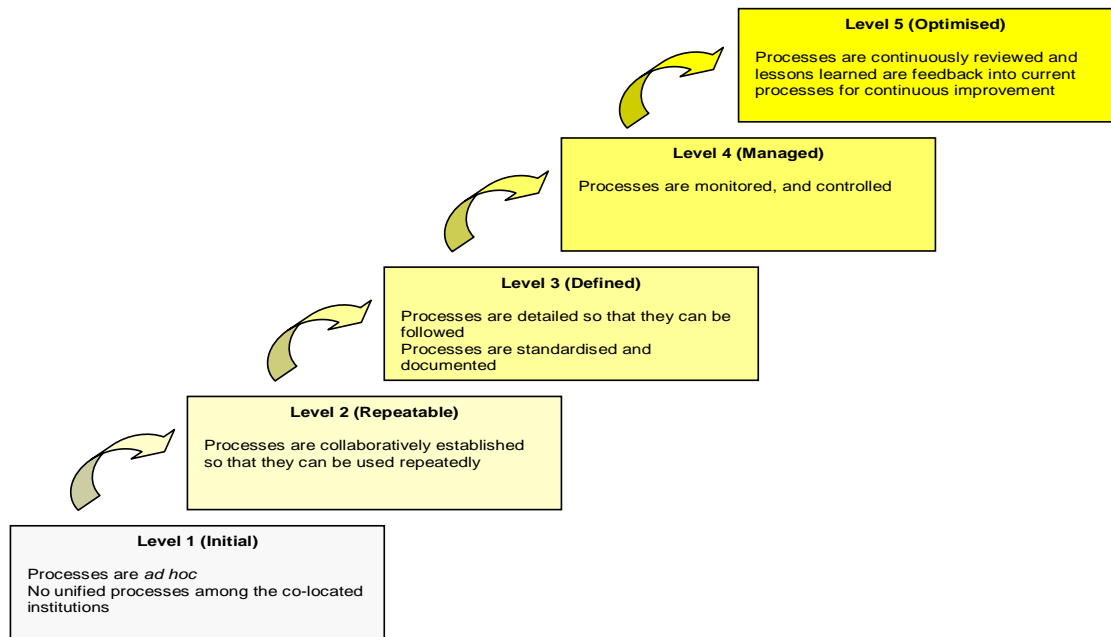


Figure 7.8: An illustration of a Process Maturity Model (After OGC, 2009)

7.4.6 Performance Aggregation

Performance measures are required to be precise to provide accurate information about improvement achieved. Producing a single indicator that tries to explain the overall picture of the measured subject has been a trend in performance measurement (Bredrup, 1994, p170). Aggregation can be a significant method to manage performance information and to focus attention on performance measures. However, aggregating qualitative measures such as flexibility and quality into a summarising indicator is a difficult task (Bredrup, 1994, p175).

The aggregated indicator provides information used for performance monitoring, performance benchmarking, policy and strategy evaluation, and decision making (Zhou *et al.*, 2006, p305). Sharp (2004, p5) found that aggregating a number of variables into a single indicator has created a significant distinction in the work of researchers between those who support this notion and others who do not. The first group think that combining two or more indicators into one indicator generates value because the produced indicator has a meaning and shows reality and is also particularly helpful in

capturing the attention and interest of decision makers. Those who do not choose to aggregate variables think that there is no need to step beyond generating a number of suitable indicators that reflect the situations of certain areas (Sharp, 2004, p5). This is because the process of assigning weights to different performance measures in order to combine them is very much subjective in nature (Sharp, 2004, p5).

Other purposes for using aggregate indicators are suggested by Saisana *et al.* (2005, p308) who stated *“Official statisticians may tend to resent composite indicators, whereby a large amount of work in data collection and editing is ‘wasted’ or ‘hidden’ behind a single number of dubious significance. However, the temptation of stakeholders and practitioners to summarize complex and sometime elusive processes into a single figure to bench-mark country performance for policy consumption seems likewise irresistible.”* Saisana and Tarantola (2002, p6) claimed that, despite alleged shortcomings, composite indicators are helpful in providing experts, stakeholders and decision-makers with information regarding:

- the direction of improvements
- benchmarking across situations and organisations
- evaluating situations and trends when compared to goals and targets
- providing early warning
- highlighting areas that need further development
- predicting of potential conditions and trends
- communicating between decision-makers and other people

7.4.6.1 Approaches to aggregation

Measures can be aggregated using the composite indicator approach which combines variables or groups of variables using weights (Sharp, 2004). An example of a well known illustration of composite indicators is the “Human Development Index” (HDI), which was developed by the United Nations Development Programme (Sharp, 2004).

A composite indicator (CI) is a mathematical aggregation of a group of individual variables that represent a wide range of concepts but generally do not share the same units of measurement. Composite indicators are used in cases where a plurality of

variables is necessary to explain certain trends (Nardo *et al.*, 2005, Zhou *et al.*, 2007). Composite indicators have been widely used to evaluate and control performance and to assist in analysing and developing public policies in a variety of fields like economic and business statistics (Munda and Nardo, 2005). Examples of composite indicators cover different disciplines like firms' innovativeness (Hollenstein, 1996), economic activities (Rua, 2002), science and technology (Grupp and Mogee, 2004), environmental sustainability (Saisana and Srebotnjak, 2006), health systems efficiency (Smith, 2002), and academic performance (Bottani, 1996). Advantages and disadvantages of composite indicators are explained in Table 7.11.

Pros and Cons of Composite Indicators	
Pros	Cons
<ul style="list-style-type: none"> • Can summarise complex or multi-dimensional issues in view of supporting decision-makers • Easier to interpret than trying to find a trend in many separate indicators • Facilitate the task of ranking countries on complex issues in a benchmarking exercise • Can assess progress of entities over time on complex issues • Reduce the size of a set of indicators or include more information within the existing size limit • Place issues of entities performance and progress at the centre of the policy arena • Facilitate communication with general public (i.e. citizens, media, etc.) and promote accountability 	<ul style="list-style-type: none"> • May send misleading messages if they are poorly constructed or misinterpreted • May invite simplistic policy conclusions • May be misused, e.g., to support a desired policy, if the construction process is not transparent and lacks sound statistical or conceptual principles • The selection of indicators and weights could be the target of political challenge • May disguise serious failings in some dimensions and increase the difficulty of identifying proper remedial action • May lead to inappropriate policies if dimensions of performance that are difficult to measure are ignored

Table 7.11: “Pros” and “Cons” of Composite Indicators

(After Saisana and Tarantola, 2002)

The increasing use of these indicators is an obvious sign of their significance in policy-making, and operational application in macroeconomics on a broader spectrum (Munda and Nardo, 2005). International organisations such as OECD, the EU, the World

Economic Forum or the IMF are constructing composite indicators in a broad array of fields (Nardo *et al.*, 2005 and Munda and Nardo, 2005).

A common goal of most of composite indicators is the ranking of objects or entities and their benchmarking as a result of some aggregated dimensions (Cherchye, 2001, Kleinknecht 2002 and OECD, 2003 cited by Munda and Nardo, 2005). Assigning weights to sub-indicators representing different variables is a critical step in aggregating them into a single composite indicator (Sharp, 2004, p10). Assigned weights can be determined by different ways such as through expert panels, focus groups, or other forms of surveys. Another way for weighting the variables is to assign them equal weights (Sharp, 2004, p10).

7.4.6.2 Weighting Methods

Several weighting techniques can be used to construct single end-result indicators. Nardo *et al.* (2005) distinguished between two types of weighting techniques. The first one developed from applications of statistics, such as factor analysis, data envelopment analysis and unobserved components models (UCM). The other, results from a direct involvement of participants and uses techniques such as budget allocation (BAL), analytic hierarchy processes (AHP) and conjoint analysis (CA). Whatever the selected method is, weights are fundamentally value judgements (Nardo *et al.*, 2005).

Saisana and Tarantola, (2002, p12) explained that principal components analysis (PCA) and factor analysis (FA) are used in producing composite indicators and their role is:

- to recognise perspectives of the observable situation
- to group the indicators
- to define the weights

7.4.6.3 Aggregation Methods

Zhou *et al.* (2006) identified two popular aggregating methods for developing composite indicators. The two methods are the simple additive weighting method (SAW) explained in Equations 1 and 2, and the weighted product method (WP) explained in Equations 3 and 4. The aggregation method in this study is applied to only one case of FE/HE co-location project. Aggregation is usually performed on the

assumption that there are many cases involved to allow performance benchmarking among involved cases.

In the scenario that there are m co-location projects $Co_i (i = 1, 2, \dots, m)$, n variables represented by performance measures $V_j (j = 1, 2, \dots, n)$, let r_{ij} be the normalised performance value (i.e. calculated as percentage of work performed) of the co-location project Co_i corresponding to the performance measure (variable) V_j . Adopting Zhou *et al.*'s, (2006, p 306) view that “the weights are often interpreted as the coefficients of importance that reflect the preference information of decision makers.”, let $W_j (j = 1, 2, \dots, n)$ be the weight of the variable V_j . Those assumptions were used in both aggregating methods as follows:

7.4.5.3.1 The Simple Additive Weighting (SAW) Method

The aggregation method in this study is applied to only one FE/HE co-location project. However, the usual way of aggregation that depends on a number of co-location projects is presented first. Then, an attempt to adjust this method to suit the need to measure the performance of a co-located project against targets set is performed.

The simple additive method is widely used for condensing performance measures (or variables) into a single index (I_i) due to its simplicity in summing up weighted values of the variables and ease of application (Esty *et al.*, 2005). The SAW formula is:

$$I_i = \sum_{j=1}^n w_j r_{ij} \quad i = 1, 2, \dots, m \quad j = 1, 2, \dots, n \quad (1)$$

In this research, the composite indicator (I) is calculated individually for each co-location case rather than summed across several co-location projects, or the whole sector therefore the formula becomes as:

$$I = \sum_{j=1}^n w_j r_j \quad j = 1, 2, \dots, n \quad (2)$$

7.4.5.3.2 The Weighted Product (WP) Method

Aggregation can be carried out using the weighted product (WP) method. Using this method, the performance index is calculated by raising each normalised value of a given performance measure in a particular co-location project r_{ij} to the power of its weight.

The equation for the weighted product (WP) method is as follow:

$$I_i = \prod_{j=1}^n (r_{ij})^{w_j} \quad i = 1, 2, \dots, m \quad j = 1, 2, \dots, n \quad (3)$$

For this research, the formula becomes as:

$$I = \prod_{j=1}^n (r_j)^{w_j} \quad j = 1, 2, \dots, n \quad (4)$$

In this study, the simple additive weighting method was used because of its simplicity to potential users.

7.4.5.4 Aggregating Performance Drivers Measures

To aggregate a set of variables (performance measures) that belong to one component (performance dimension) using the simple additive weighting method, weightings of those variables (performance measures) were needed.

Variables	Component loadings				Squared loadings	Sum of squared loadings	Normalised weights
	1 Collaborative building development	2 Collaborative institutional management	3 Sharing educational knowledge	4 Transition administration			
Construction cost	0.868				0.753	2.594	29%
Construction time	0.868				0.753		29%
Construction service quality	0.827				0.684		26%
Procurement and delivery service	0.636				0.404		16%
Administration process		0.844			0.712	2.382	30%
Life cycle costing		0.727			0.529		22%
Trust building		0.684			0.468		20%
Staff and human resource development		0.630			0.397		16%
Quality of the academic staff		0.525			0.276		12%
Academic articulation			0.909		0.826	2.120	39%
Effective communication			0.779		0.607		29%
Meeting the needs for educational services			0.661		0.437		20%
Promoting the strengths of the FE/HE co-located institutions			0.500		0.250		12%
Minimising disruption during delivery stage				0.811	0.658	1.364	48%
Satisfaction during delivery stage				0.609	0.371		27%
Staff involvement and buy in				0.579	0.335		25%

Table 7.12: Weighting of the 16 Performance Drivers Measures (Adapted from Table 7.4)

The Varimax rotated component loading matrix (ESI, 2005, p92) was used. In the resulting matrix (Table 7.12), the component loadings of each variable (performance measure) belonging to each of the four components (performance dimensions) were squared to eliminate the possibility of negative weighting (ESI, 2005, p92). The squared values were then added up together within the same component. The normalised weighting of each variable was then calculated by dividing each variable's original weighting by the summation of squared values that were then added up together within the same component. Using equation (2), the performance index of "Collaborative building development" (CBDI) is calculated as follows:

$$\begin{aligned} \text{CBDI} = & (\text{construction cost} \times 0.29) & + \\ & (\text{construction time} \times 0.29) & + \\ & (\text{construction service quality} \times 0.26) + \\ & (\text{procurement and delivery service} \times 0.16) \end{aligned}$$

In a similar way, the other indices are calculated as follows:

$$\begin{aligned} \text{The performance index of "Collaborative institutional management" (CIMI)} = & \\ & (\text{administration process} \times 0.30) & + \\ & (\text{project life cycle costing} \times 0.22) & + \\ & (\text{trust building} \times 0.20) & + \\ & (\text{staff and human resource development} \times 0.16) + \\ & (\text{Quality of the academic staff} \times 0.12) \end{aligned}$$

$$\begin{aligned} \text{The performance index of "Sharing educational knowledge" (SEI)} = & \\ & (\text{academic articulation} \times 0.39) & + \\ & (\text{communication} \times 0.29) & + \\ & (\text{meeting the needs for educational services} \times 0.20) + \\ & (\text{Promoting the strengths of the FE/HE co-located institutions} \times 0.12) \end{aligned}$$

$$\begin{aligned} \text{The performance index of "Transition administration" (TAI)} = & \\ & (\text{Minimising disruption during delivery stag} \times 0.30) + \\ & (\text{end-users involvement} \times 0.22) & + \\ & (\text{satisfaction with construction service} \times 0.20) \end{aligned}$$

7.4.5.5 Aggregating the Performance Drivers Dimensions

It is suggested, in this study, that the squared factor loadings of every variable on each component (performance dimension) are added up to form the weighting of that particular dimension. Therefore, the sum of the squared factor loadings of the components of the “performance drivers” is added to the sum of the squared factor loadings of the components of the “performance results”.

Variables	Component loadings			
	1	2	3	4
	Collaborative building development	Collaborative institutional management	Sharing educational knowledge	Transition administration
	Squared component loading	Squared component loading	Squared component loading	Squared component loading
Construction cost	0.753			
Construction time	0.753			
Construction service quality	0.684			
Procurement and delivery service	0.404			
Administration process		0.712		
Life cycle costing		0.529		
Trust building		0.468		
Staff and human resource development		0.397		
Quality of the academic staff		0.276		
Academic articulation			0.826	
Effective communication			0.607	
Meeting the needs for educational services			0.437	
Promoting FE/HE co-located institutions			0.250	
Minimising disruption during delivery stage				0.658
Satisfaction during delivery stage				0.371
Staff involvement and buy in				0.335
Sum of squared loadings	2.594	2.382	2.120	1.364
Normalised weights	31%	28%	25%	16%

Table 7.13: Weighting of the 4 Performance Drivers Dimensions

(Adapted from Table 7.4)

The four components in Table 7.13 represent four performance dimensions of the performance drivers perspective. To calculate the weight of component one (Collaborative building development), each factor loading of every variable on that

component was squared. All the squared results were added and normalised in a similar way to weighting the performance measures in the previous section. Table 7.13 presents the four dimensions of performance drivers and their corresponding weights.

Based on this table and the calculation made in the previous section, the performance drivers index (PDI) can be calculated as follows:

$$\begin{aligned} \text{PDI} = & (\text{CBDI} \times 0.31) + \\ & (\text{CIMI} \times 0.28) + \\ & (\text{SKI} \times 0.25) + \\ & (\text{TAI} \times 0.16) \end{aligned}$$

7.4.5.6 Aggregating Performance Results Measures

To work out the weights of the performance results, similar steps to calculating the weights of the performance drivers measures in Section 7.4.5.4 were followed. Table 7.14 illustrates the weighting of the 12 performance measures of the performance results.

Variables	Component loadings			Squared loadings	Sum of squared loadings	Normalised weights
	1	2	3			
	Learning built environment	Collaborative educational provision	Co-location sustainability			
Space efficiency	0.848			0.719	3.558	20%
Space productivity (income)	0.846			0.716		20%
Cost effectiveness	0.789			0.623		18%
End users satisfaction (shared facilities)	0.778			0.605		17%
End users satisfaction (shared space)	0.721			0.520		15%
Building quality	0.612			0.375		10%
Student achievements		0.929		0.863	3.023	29%
Student retention		0.897		0.805		27%
Student with the shared education		0.890		0.792		26%
Student recruitment		0.750		0.563		18%
Efficiency of using water			0.940	0.884	1.716	51%
Energy efficiency			0.912	0.832		49%

Table 7.14: Weighting of the 12 Performance Results Measures

(Adapted from Table 7.9)

Using Equation 2, the performance indexes of the performance results dimensions are calculated as follow:

The performance index of the “Learning built environment” (LBEI) =
 (space efficiency x 0.20) +
 (space productivity x 0.20) +
 (cost effectiveness x 0.18) +
 (satisfaction with the shared facilities x 0.17) +
 (satisfaction with shared space x 0.15) +
 (building quality x 0.10)

The performance index of the “Collaborative educational provision” (CEPI) =
 (student achievements x 0.29) +
 (student retention x 0.27) +
 (satisfaction with the shared education x 0.26) +
 (student recruitment x 0.18)

The performance index of the “Co-location sustainability” (CSI) =
 (efficiency of using water x 0.51) +
 (energy efficiency x 0.49)

7.4.5.7 Aggregating the Performance Results Dimensions

The weightings of the performance results dimensions were calculated following similar steps to the ones that were used to determine the weightings of the dimensions of the performance drivers in Section 7.4.5.5. Table 7.15 shows the performance results dimensions and their corresponding weights.

Based on this table and the calculation made in the previous section, the performance results index (PRI) can be calculated as follows:

PRI = (LBEI x 0.43) +
 (CEPI x 0.36) +
 (CSI x 0.21)

Variables	Component loadings		
	1 Learning built environment	2 Collaborative educational provision	3 Co-location sustainability
	Squared component loading	Squared component loading	Squared component loading
Space efficiency	0.719		
Space productivity (income)	0.716		
Cost effectiveness	0.623		
End users satisfaction with the shared facilities	0.605		
End users satisfaction with shared space	0.520		
Building quality	0.375		
Student achievements		0.863	
Student retention		0.805	
Student with the shared education		0.792	
Student recruitment		0.563	
Efficiency of using water			0.884
Energy efficiency			0.832
Added squared weights	3.558	3.023	1.716
Normalised weights	43%	36%	21%

Table 7.15: Weighting of the 3 Performance Results Dimensions

(Adapted from Table 7.9)

7.4.5.8 Aggregating the Two Performance Perspectives

The assumption that the overall performance has two distinctive perspectives, which are performance drivers and performance results, was adopted to calculate the weightings of both perspectives and the overall performance index (OPI). In order to do this, the weightings (Squared component loading) of the four components of the performance drivers perspectives (performance dimensions) calculated in table 7.13, were added together to form the sum of squared component loading of the performance drivers' perspective (Table 7.16).

	Components				Performance drivers perspective
	1 Collaborative building development	2 Collaborative institutional management	3 Sharing knowledge	4 Transition administration	
	Squared component loading	Squared component loading	Squared component loading	Squared component loading	Sum of squared component loadings
Added squared weights	2.594	2.382	2.120	1.364	8.460

Table 7.16: Squared Component Loading of the Performance Drivers Perspective

In a similar way, the weightings (squared component loading) of the three components (performance results dimensions) were added together to sum the squared component loadings of the performance results part (Table 7.17).

	Components			Performance results perspective
	1 Learning built environment	2 Collaborative educational provision	3 Co-location sustainability	
	Squared component loading	Squared component loading	Squared component loading	Sum of squared component loadings
Added squared weights	3.557	3.022	1.715	8.294

Table 7.17: Squared component loading of the performance results part

Then, the two summations were added up to assist in normalising each part of the overall performance. Table 7.18 explains this process.

	Performance drivers dimension	Performance results dimension	Overall performance
	Sum of squared component loading	Sum of squared component loading	Sum of squared component loadings
Added squared weights	8.460	8.294	16.754
Normalised weights	50.6%	49.4%	100%

Table 7.18: Weightings of the two performance perspectives

Based on the above, the Overall Performance Index (OPI) can be calculated as follows:

$$\text{OPI} = (\text{PDI} \times 0.51) + (\text{PRI} \times 0.49)$$

The overall performance aggregation is illustrated in Figure 7.9.

Chapter 7: Establishing the Measurement Framework

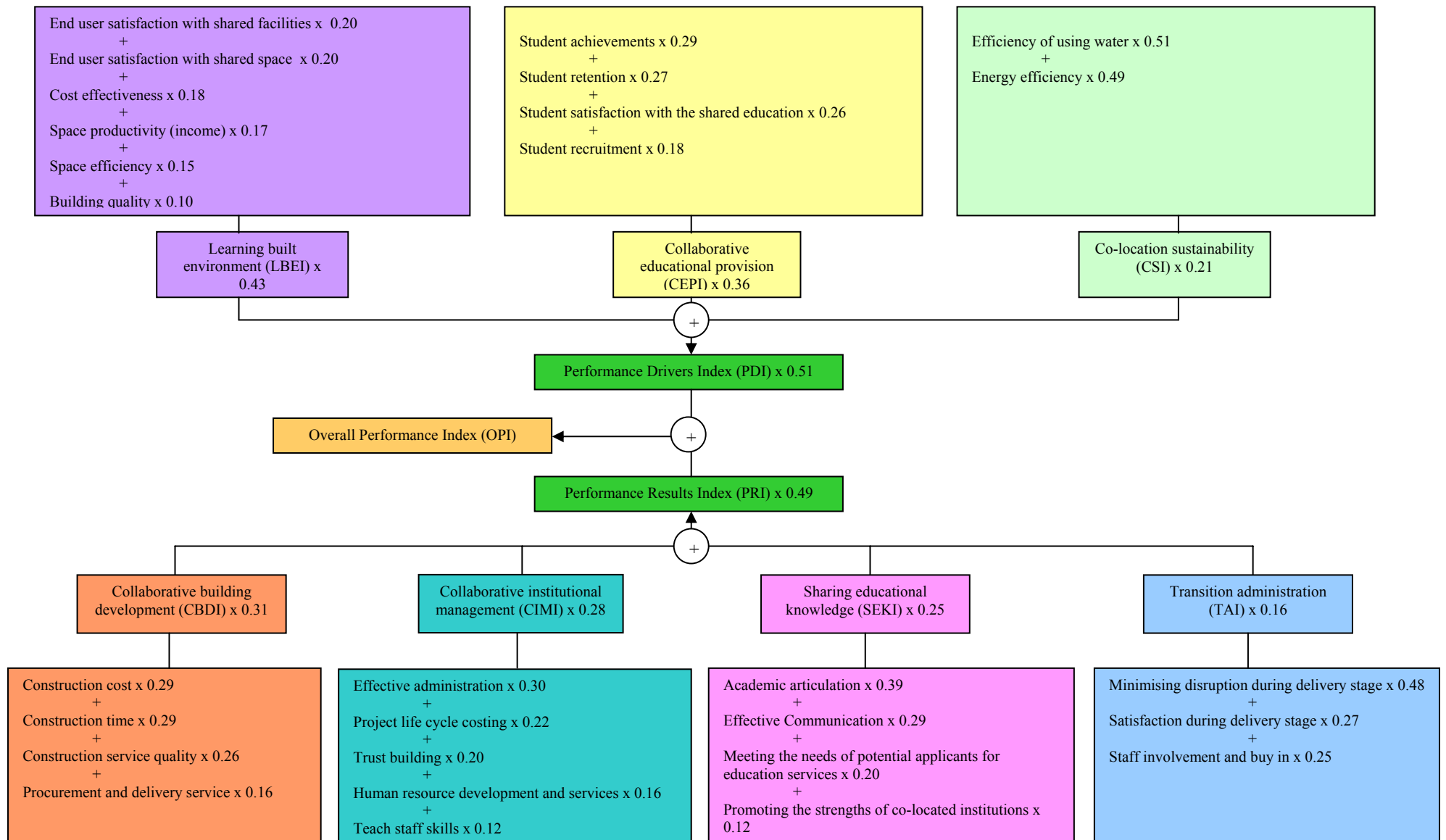


Figure 7.9: Aggregation of Performance Measures

The development of the overall conceptual framework was based on the idea that business performance has two major perspectives; performance drivers and performance results. This idea was expressed in the EFQM Excellence Model (2007) and by Fitzgerald *et al.* (1991)'s 'Results and Determinants' model. The concept implicitly explains the causal relationship between the two performance perspectives in that good results are achieved by focusing on performance drivers. The framework also adopted Atkinson's (1999) view in which project success is presented as three dimensions spanning over two project stages: the delivery stage and the post-delivery stage. The delivery stage has one success dimension related to project efficiency. The post-delivery stage has two success dimensions related to the business that the product is supporting and the benefits to customers and end-users of a business. Literature showed similar views in which project success has been examined from two viewpoints. de Wit (1988) distinguished between project management success and project success. Lim and Mohamed (1999) alternatively explained that project success should be looked at from macro and micro viewpoints. Other researchers support this concept (Pinto and Pinto, 1991; Shenhar *et al.*, 2000; Freeman and Beale, 1992; Shenhar *et al.*, 1997; Sadeh *et al.*, 2000). These common views give more validity to the structure of the performance measurement framework established in this chapter. The work of these authors, as explained in Chapter 3, showed that the first viewpoint focuses on the project delivery stage through which the construction project is executed. The other viewpoint focuses on the post-delivery stage that continues beyond conventional construction project conclusion shortly after handover into the constructed facility lifecycle.

The framework also adopted principles identified as strengths of performance measurement frameworks (recall Chapters 2 and 4). The framework has a hierarchal structure which expresses integration across the different business functions of an organisation similarly to the Du Pont Pyramid of Financial Ratios. It also reflects an organisation's multidimensional environment to organisations the opportunity to give enhance their competitive advantage by extending performance measurement to include measures that focus on customer satisfaction and growth as suggested by Keegan *et al.* (1989). The framework illustrates how objectives are disseminated from senior management of an organisation vertically through the levels from the top down to the operators similarly to the Performance Pyramid (Lynch and Cross, 1991).

This measurement framework also shows the way the performance measures are populated with data from the bottom level of the pyramid upwards (Lynch and Cross, 1995). The framework clearly explains relationships among the performance measures forming different dimensions of business performance (Neely *et al.*, 2000). In addition, it demonstrates the notion of causality in which efficiency of the FE/HE co-location project during the delivery stage can have an impact of the effectiveness of the outcomes of the collaborating institutions in the medium and long terms and the way students and staff and other external stakeholders might perceive these outcomes. This notion was expressed by Lynch and Cross (1991) and Fitzgerald *et al.* (1991) and the European Foundation for Quality Management Excellence Model (1992).

The measurement framework was designed to follow a scoring system similar to the one developed by the EFQM Excellence Model which gives equal weight to “enablers” and “results”. This analysis above demonstrated the wider FE/HE sector places nearly equal importance on both performance perspectives.

Focusing on stakeholders is another principle that the established performance measurement followed as recommended by Neely *et al.* (2001) through their Performance Prism. Consequently, the framework considers the views of a wide range of stakeholders, who are affecting in or are affected by the business, such as investors, customers, employees, and policy makers (Tangen, 2004).

7.5 Conclusion

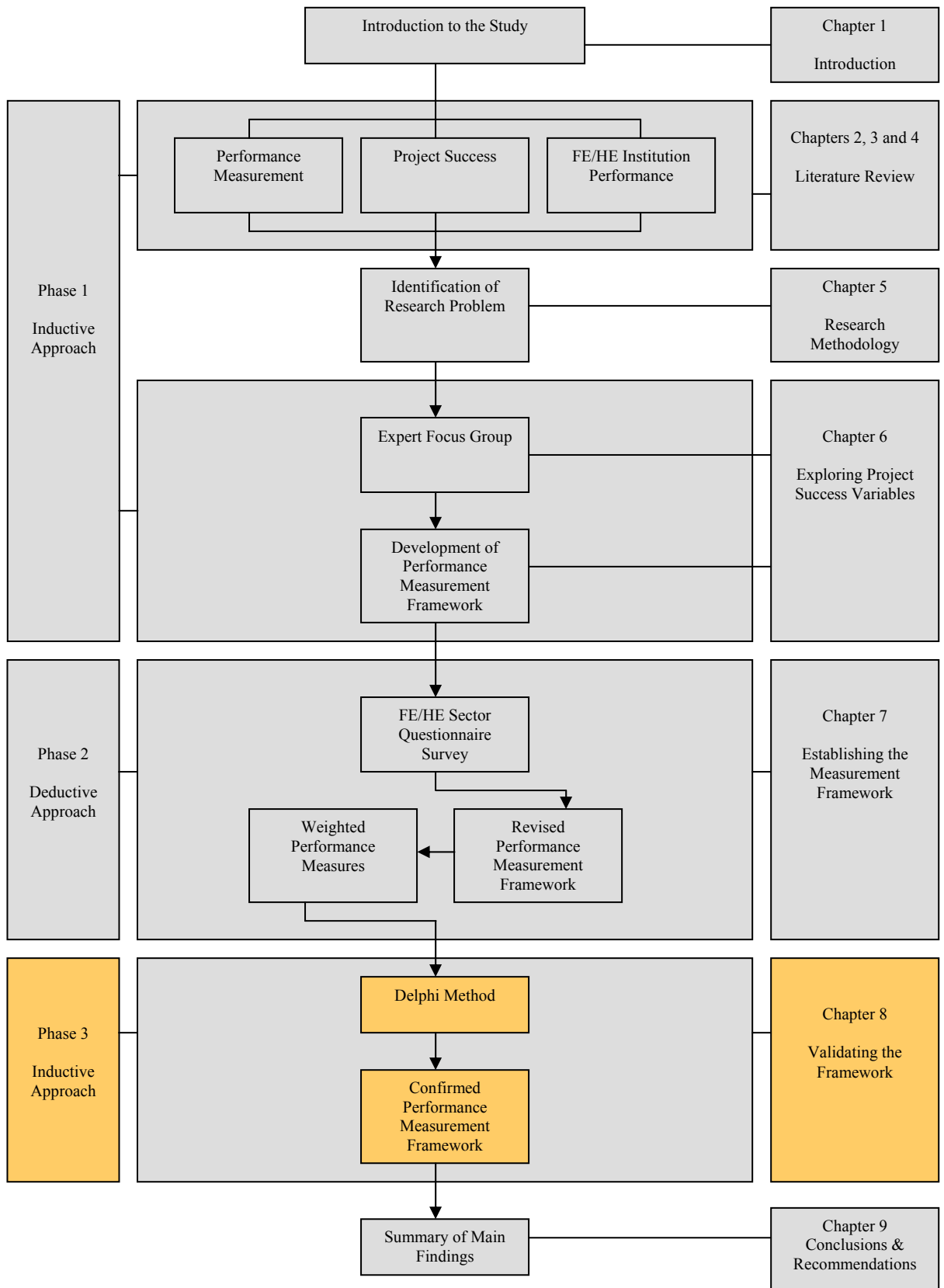
The established measurement framework was based on the assumption that the overall performance comprises two perspectives. The data analysis on each perspective showed that each perspective has a number of components. For example, the performance drivers' perspective consists of collaborate education provision, collaborate campus management, construction performance and transition administration. Likewise, the performance results perspective consists of Shared Education Support, Learning Environment and Sustainability.

Each component resulted from factor analysis was considered either as a performance driver dimension or as a performance result dimension. These dimensions interpret the interrelationships between the variables (performance measures) in the performance driver perspective or between the variables (performance measures) in the performance results perspective.

This chapter also introduced an aggregating method through which the different performance measures in one performance dimension can be combined into a single performance dimension index. In addition, a suggestion was made to aggregate the different performance dimensions in one performance perspective into a single performance perspective index. On this basis, the formula of calculating the overall performance index was also presented.

The findings of this chapter that were based on the perception of the FE/HE sector in Scotland of performance measures that characterise successful FE/HE co-location project will be further examined by investigating those findings with a panel of experts who have the experience in managing these types of projects.

Chapter 8: Validating the Measurement Framework



Chapter 8: Validating the framework

8.1 Introduction

The last chapter focused on testing the performance measurement framework which was developed in the early stages of this study using the findings of the literature review and results of the exploratory focus group workshop carried out with a small sample of people with FE/HE co-location experience. In addition, the overall measurement framework included two types of performance measures that are quantitative and qualitative in nature. The assessment of those two types of measures needed different approaches. Consequently, quantitative and qualitative forms of assessment techniques were suggested. In addition, an aggregating method was also adopted to summarise performance measures and performance dimensions at each level of the measurement framework hierarchy into a single indicative index.

This chapter presents the validation of the framework. This process, which marked the third and last phase of the study, used the Delphi method. An inductive approach was followed to explore the opinions of people who were experienced in the field of FE/HE co-location projects and confirm the suitability of framework structure, performance measures and the methods of measurement.

8.2 The Delphi Method

According to Krishnaswamy *et al.* (2009, p59), the Delphi method is a data collection technique that can be defined as:

“a survey technique for achieving consensus among isolated anonymous participants with a controlled feedback of opinions. This method is the application of the expert opinion to problem solution, problem identification, or the temporal location of a problem.”

The Delphi method collects the opinions of a group of experts (panel) through a series of structured data gathering rounds with participants (Kahn, 2006, p.42) who are not supposed to know the identity of the other members in the panel and they should be physically isolated (Sweeney, 2009, p.215). The collective opinion of the panel is sought indirectly through a number of iterative questionnaires distributed to the experts

members by a monitor, who could be the researcher and who forms the only means of communication between the group (Kerr *et al.*, 2000, p.182). Each session in the Delphi process offers the chance to combine the outcomes of the previous one, refine them and put them forward for further investigation until a consensus is reached (Kahn, 2006, p.42).

The Delphi method is used in research for a number of purposes such as assuring that potential alternatives relating to a specific subject are brought forward for discussion, assessing the effects of any selected alternative, or examining the acceptability of any selected alternative (Ziglio, 1996, p.8).

8.3 Delphi Method Design and Application

Researchers who use the Delphi method follow a number of steps required for designing and applying this method (Loo, 2002, p.764). These steps are:

- Problem definition
- Panel selection and size
- Conducting the Delphi rounds

8.3.1 Problem Definition

Identifying the problems and, consequently, the objectives of this phase of the study are important for ensuring that those objectives can be addressed appropriately by the Delphi method. The problem at this phase is that the performance measurement framework was structured on the basis of the opinions of respondents of a larger FE/HE institution sample, who had not been involved in a co-location project. However, they held positions similar to those positions held by people who were directly involved in a co-location project. Therefore, the developed framework needed to be validated. The objectives of this phase of the study were:

- To review the structure of the performance measurement framework developed by the last phase of study.
- To examine the contents of the developed framework.
- To confirm the methods of measurement in the developed framework.

8.3.2 Panel Selection and Size

The Delphi method involves identifying the opinion of a group of participants forming a panel of experts in the issue under investigation (Loo, 2002, p764). Participants are selected by their expertise, knowledge of the area under discussion, time available to participate, and capacity and willingness to critique the presented problems (Ziglio, 1996, p.14). In addition, having experience in a particular subject or being stakeholders can also justify the inclusion of an expert (Loo, 2002, p764).

The number of participants selected to form a panel of experts does not follow a statistical approach (Ziglio, 1996, p.14). A group of homogeneous participants could include 10 to 15 members and this type of group is expected to produce good outcomes. In heterogeneous cases, where a number of different individuals, in terms of knowledge, experience and stakeholder representation are sought, sample size is expected to be greater (Ziglio, 1996, p.14).

In this study, participants were selected for being stakeholders and having experience in a FE/HE co-location project. They represented the co-location educational institutions and the funding body from the Heriot-Watt University and Borders College co-location project, the project that was used at the first phase of this study (Table 8.1). The sample selected for the Delphi survey included people who participated in the focus group workshop conducted in the first phase of the study.

This panel of experts formed a heterogeneous group who have experience of managing this type of project and educational collaboration. Members of the panel were carefully selected to ensure reliable results. Five members formed the panel which is less than the number recommended by Ziglio (1996, p.14). However, it is important to highlight the fact that the study has been through two phases prior to this to explore, develop and revise a set of project success criteria and performance measures forming a comprehensive framework. This required using different research methods and techniques. This justified, from the researcher's point of view, the Delphi panel size.

Member's role	Organisation
Director of Planning	Heriot-Watt University
Director of Campus Services (Borders Campus)	Heriot-Watt University
Assistant Principal	Borders College
Policy Officer	Scottish Funding Council
Assistant Director of Capital Projects	Scottish Funding Council

Table 8.1: Members of the Expert Panel

8.4 Conducting the Delphi Sessions

Having been selected, the members of the panel were emailed information explaining the aim of using the Delphi method, the anticipated duration of the structured interviews and the importance of their views and opinions in validating the performance measurement framework. The Delphi method in this study involved a number of sessions through which the researcher presented the structure of the framework, explained its purpose and demonstrated how FE/HE co-location project performance is measured by each member of the expert panel. The overall feedback about the measurement framework, particular concerns and additional ideas were then collected. These sessions were recorded to capture comments that were not written on paper. The researcher, then, summarised the results, modified the measurement framework if needed, and prepared for the next session which engaged the next panel member in an iterative way (Figure 8.1). The sequence of the sessions was not important. The results of the final session were emailed to all expert panel members to for final feedback. This gave all experts the opportunity to provide new insights and introduce new ideas, if they had any, in response to the results of the final session.

A questionnaire was left with each member after their discussion with the researcher. The expert, after completing the questionnaire, returned it to the researcher. Recognising the overall objectives of the study and the outcomes of the previous two phases, the Delphi survey sought to validate the framework. The questionnaire used in the Delphi process was designed to support the validation process by capturing the opinions of the experts on the overall performance measurement framework; the performance measures; the performance measurement methods; and weighting the different hierarchal levels of the measurement.

The questionnaire comprised six sections. The first section included categorical questions about who the members are. The second, third and fourth sections comprised scaled questions that sought the respondents' opinion about the extent to which the structure of the measurement framework, its performance measures and the methods of measurement matched a set of recommended criteria. These criteria were developed from performance measurement literature (Tables 2.2, 2.3 and 2.4). These questions were measured using the Likert scale. Section five included rating questions. Answering questions of section five required the respondents to assign weightings to the two performance perspectives and performance dimensions within each perspective. These weightings represent the relative importance of these performance aspects in characterising FE/HE co-location project success.

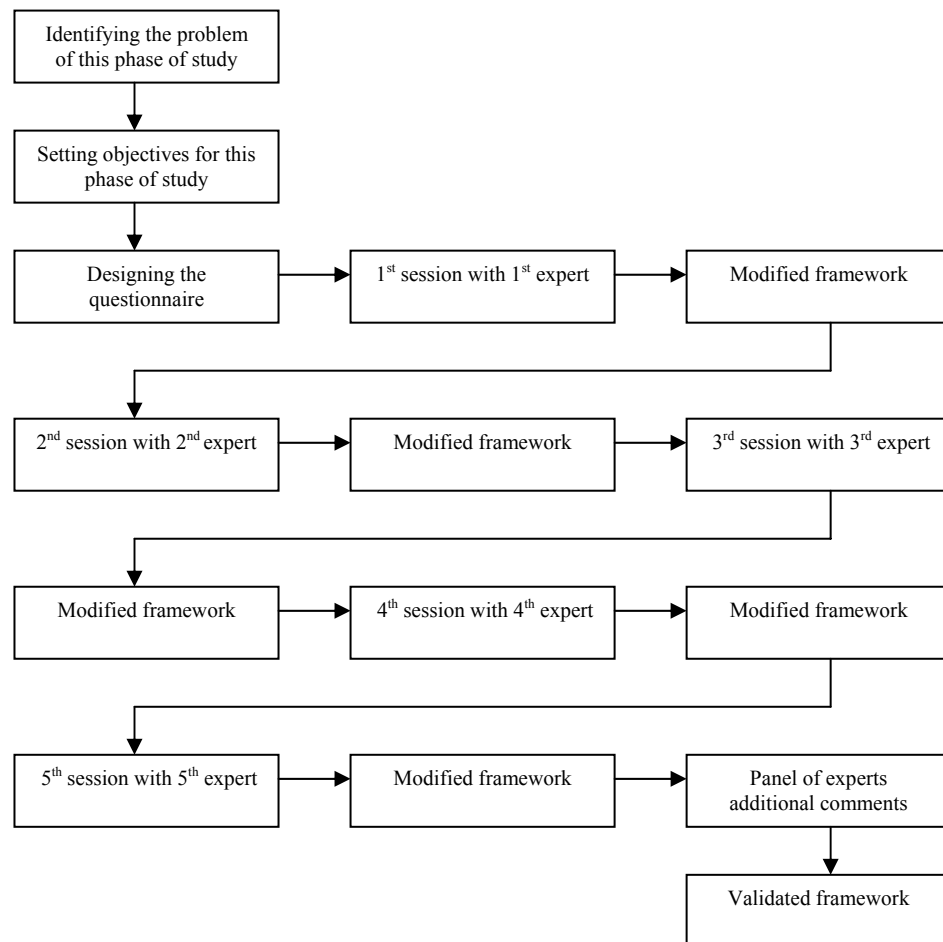


Figure 8.1: The Iterative Process of the Delphi Method in this Study

8.5 Delphi Results

The researcher implemented the Delphi survey by meeting each panel member individually and revising the framework as necessary between each meeting. The purpose of the meeting was to critique the measurement framework (a copy of which had been sent to each respondent before the meeting), explain and clarify any identified problem that might have biased their responses and to capture the expert's opinion about the overall measurement framework, the performance measures and the measurement methods.

On concluding the discussion, a questionnaire was left with each respondent to gather their structured views of the effectiveness of the framework as a performance measurement tool and the importance weighting that should be applied to each measure within it. This questionnaire is discussed after the Delphi survey observations presented below.

8.5.1 First Session

In this session, the structure of the established FE/HE co-location project framework, the different types of performance measures used in the framework and the way of measurement were explained. Then, the comments of the expert on the overall performance measurement framework were elicited. This member of the panel considered the seven performance dimensions of the measurement framework to be comprehensive. To quote:

I entirely agree and accept that. That's the right way to look at it. Are those four main headings under the performance drivers and the three main headings under this performance results the right headings and are there any other main headings you should consider? I think those headings capture the [different performance dimensions] and do not omit any priority.

The expert, however, expressed dissatisfaction with the third level of the framework which included the performance measures of both performance drivers and performance results. In the performance results part, the expert suggested that the performance

measures that assess the co-location sustainability were too focused on environmental issues whereas they needed to include other aspects of sustainability. He said:

At the level of what is beneath those [performance dimensions], there are some issues of detail. Those lists are indicative and illustrative rather than exclusive and comprehensive. For example, estates sustainability got two bullet points that are quite sparse. There probably are other indicators of sustainability.

In addition, the expert speculated that there were broader aspects that needed to be considered as part of the FE/HE co-location success. These aspects are linked to the impacts that the co-location project could have on the community. The expert commented:

I suppose an overall reaction is this is in some way quite introspective and this is the approach that we agreed we would take but there is a set of objectives apart from contribution to the community and contribution to the economy that are indicators of our success. How do you reflect that wider perspective of the community stakeholders and founders' stakeholders?

It can be argued that those two criteria could be measured in a number of ways. To reflect on the wider community, promoting the strength and advantages of the co-location through the community as a unique educational provider is a significant measure to enhance the image of the shared campus in providing quality education and professional training. The courses and programmes offered by the collaborating institutions, whether they are designed to suit their students' needs or external individuals or organisations, can affect the number of newcomers into the campus from the surrounding neighbourhoods and other geographically remote areas seeking educational and professional services. Those two performance measures in addition to the "space productivity" measure give indications to the funders about whether their investment in this type of shared campus is delivering good value for the money invested.

I agree that if we increase student numbers and increase productivity, we would be meeting the requirements of those other stakeholders but this wouldn't necessarily be so. We could increase financial productivity or student numbers by doing things that are not relevant to the Borders region but don't lead the students to getting employed. I think you need to reflect on that issue. There are wider stakeholders whose expectations are probably aligned with ours. The collective view of everyone you surveyed was that it's not the institutions [role] to adopt indicators that they can't control but you need to think about the relationship of the performance indicators here that we do control and measure and how they articulate with wider society.

The expert considered that the measurement framework did not miss any other performance measures, apart from those belonging to the co-location sustainability dimension:

There are no specific things that I thought should be included that have been omitted except for the sustainability.

The expert, on the other hand, raised the issue of excluding a performance measure. The expert emphasised that human resource development and services were not part of the collaboration between the FE/HE institutions in the project he was involved in. Therefore, the expert suggested that that performance measure should be taken out of the list of performance measures. To quote:

The "Staff and human resource development and services" is the only one thing that I would possibly say is wrong. We have not led a commitment to share human resources.

Another performance measure was highlighted. It is related to the quality of the academic staff. In a co-location situation, the staff could teach higher education students as well as further education students. Therefore, teaching staff should be aware of the requirements and the needs for each group of students. However, the expert mentioned that the focus should be on teaching quality because further education institutions do not do research. He commented:

I agree with that. I think that is more like the skills of academic staff. We talk about quality in terms of the quality of research and that is outside the scope of collaboration. But teaching skills are very much within the scope, and that is right and appropriate.

In addition, the expert had concerns about engaging the students of FE/HE institutions in understanding the co-location processes that the collaborating institutions were going to follow. The concept of including this performance measure is that in some situations, such as co-locating FE/HE institutions, change is inevitable. Staff and/or students used to work or study under certain conditions might resist this change. Therefore, it is important for the management of the FE/HE co-location project to recognise those difficulties and to communicate effectively with the students and staff who might raise issues relating to their resistance in a way that can minimise the negative impacts of this transformation. The expert stated that:

I've questioned "engaging students in understanding the importance of FE/HE co-location".....I agree that it's entirely appropriate that all members of staff should understand the framework within which the College and the University operate and within which we've chosen co-location as the best course of action. The question is whether students need to worry about all that stuff. I don't think we should be trying to explain to them the concept of tertiary education.

An example of how to assess one of the qualitative performance measures was presented and explained (Appendix C). This example was emailed to each expert of the panel before each session to have an overview of the measurement methods. This example was "communication between FE/HE co-located institutions". As suggested in the previous chapter, these types of performance measures are measured using five-level maturity model. The idea was to validate the methods of measuring this type of performance measure by such a maturity model. The member's response to the way qualitative performance measure is assessed was:

I haven't looked at the details but I've looked enough to recognise, in my view, it has a very logical structure and it does, broadly speaking, it looks like you have interpreted appropriately to the circumstances of higher and further education undertaken. Also I think the way that struck me most was the imaginative approach in particular of the leading indicators. The leading indicators that are based around "communication" example I think that is novel and imaginative. It is difficult to measure, but this kind of maturity model is as good as an approach to measuring the immeasurable. It seems, in principle, reasonable and well applicable to the kind of undertaking we're involved in.

The expert commented on the suggested frequency of measurement. He asserted that the measurement frequency should be independent of co-location project progress. The expert justified his position by saying:

I think that [the frequency of measurement] should be based on the process itself. This is qualitative stuff and it needs to be subject to qualitative judgements like when is the right time? What is the right format to take this measurement and it would be a matter of various points that the owner of this indicator would reflect and summarise these reflections in a report to who they think is appropriate and may be even who makes this measurement is a matter of judgement actually.

In addition, the expert suggested a method by which the qualitative performance measures could be judged, viz.:

You would want some focus group or interview technique that a group of identified stakeholders would periodically give their opinion in a reflective way as to how communication is performing against this model.

The suggested method is consistent with the expert's statement made earlier which concluded that qualitative measurement necessitates qualitative judgement. The focus group or group interview techniques are valid ways to perform the judgment. However, people participating in these types of group discussion should be selected on the basis of

their involvement in the co-location project to increase the reliability of their judgements.

In addition to the illustration of qualitative performance measurement, the expert was also provided with an illustration of quantitative performance measurement represented by “space efficiency” (Appendix D). This example focused on measuring the rates of frequency, occupancy and utilisation in addition to measuring space/student rates for teaching, learning centre and office spaces. In addition, graphs were developed using Estates Management Statistics (EMS), a database dedicated to FE institutions, and e-Mandate, a database dedicated to HE institutions, to show space performance of both further and higher education institutions in Scotland and in the UK in terms of space efficiency. The plotted graphs included medians for different measures which can be used as benchmarks. The opinion of the expert regarding this representation of data is expressed in his statement:

There is no problem with space efficiency. These are good measures. You've got to measure them annually... It is excessive data for many practical purposes. You're scoping a framework that is potentially usable by the whole sector. Each individual institution could say I prefer to look at gross internal area per student or different institution might say no I'm more interested in net internal area. You need to offer this menu to satisfy everyone.

The opinion of the expert clearly shows that measuring this quantitative performance measure was acceptable. He further suggested measuring it annually. This suggestion corresponds with the release of data sources that are needed to do the measurement. Besides, the expert considered that the interest of FE/HE institutions will inform their selection of the ways by which the space efficiency. Another reason is linked to the cost of measurement. To quote:

You need to think about what it does cost to do all these measurements. You need to keep thinking what's the cost benefit trade offs but if you take it back to annually, which is I think the right frequency, it'll less much cost you.

The expert emphasised that taking all these measurements could be costly. Therefore, a cost and benefit trade off is needed to find an appropriate frequency of measurement.

At the end of this session, the framework was revised in responses to the panel member's critique. The modified version of the measurement framework, the two examples of the quantitative and qualitative performance measures and the questionnaire were then emailed to the next expert to gather further comments. The modified framework is presented in Figure 8.2.

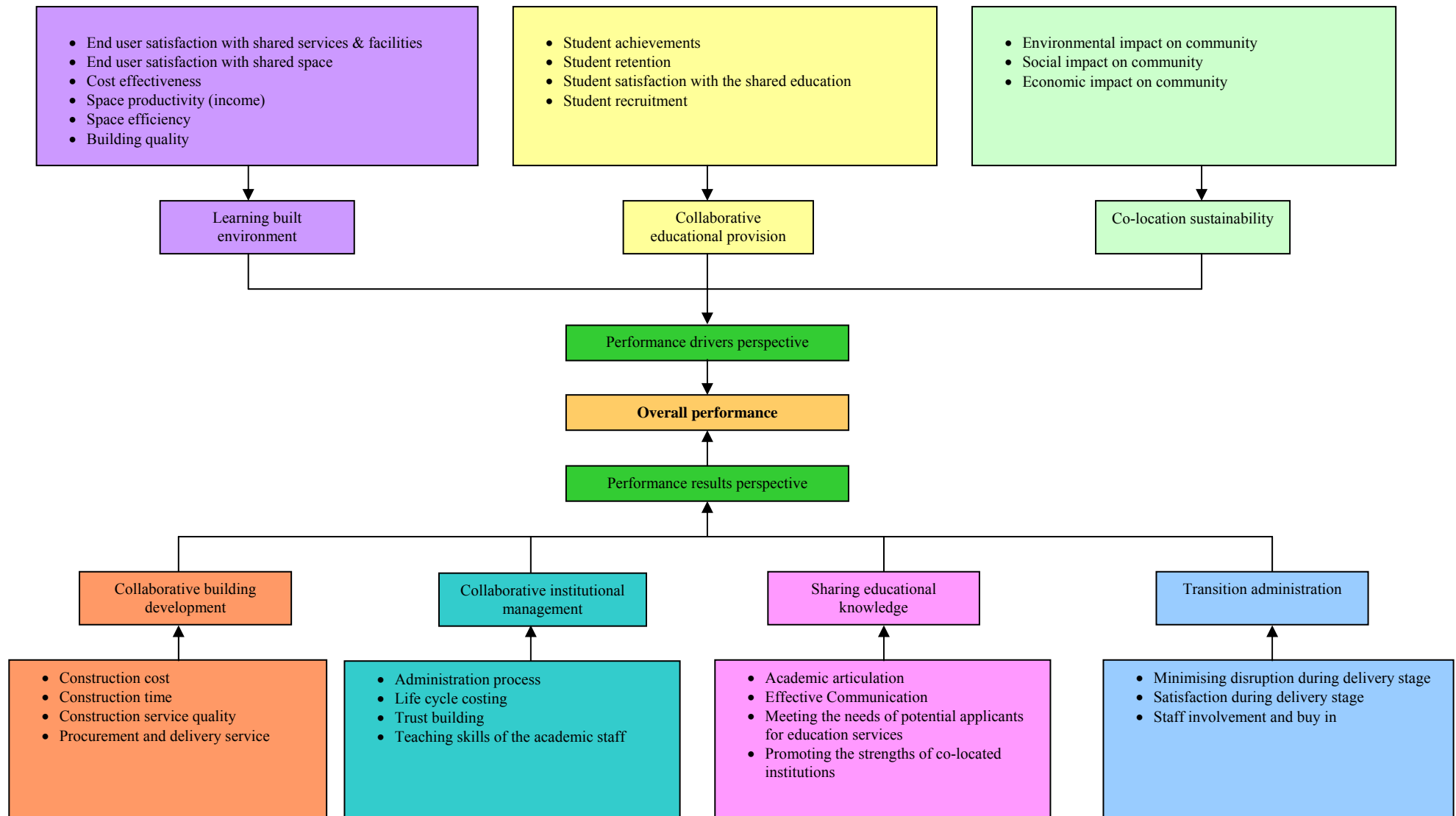


Figure 8.2: The Performance Measurement Modified after the First Session

8.5.2 Second Session

The updated framework was presented to the second member of the experts' panel with brief explanation of the different hierarchal levels. As with last member, the overall measurement framework, the performance measures used and the methods of measurement were presented. The expert expressed satisfaction with the measurement framework by saying:

I think this is very logical. It is good, seeing you develop this [framework] and I am fairly happy with it. It really is a good and very interesting piece of work.

Changes made to the “campus sustainability” dimension were made to better explain the impact that a FE/HE co-location campus would have on the community. The expert commented on this revision by stating:

The purpose of the exercise is not to support the local community or to develop the local community economically. The purpose of the exercise is to educate students, both College students and University students. While it's important, to me, it's a secondary issue.....There was support in terms of the planning process, making sure that nothing was held up too far, it actually went very smoothly. We did have good support from them [community]; there is no doubt about this. They [community] may have helped a little at the sideline in terms of making sure this would go forward, but the primary work wasn't done by them. Other people may have a different view.

The previous expert had suggested that “Staff and human resource development” did not particularly apply to the specific Heriot-Watt University and Borders College co-location project and did not, therefore, required to be included in the measurement framework. However, the expert in this session had a different view about the removal of the indicator. He stated that:

We deliberately decided to leave HR out of a shared service because there are two different employers with two different sets of conditions. College lecturers and University lecturers are differently paid and their

jobs are differently structured, so we didn't take the view that HR specifically was something we should integrate at this stage. In terms of human resources development and services, I would leave it in.

Moving to the suggested method of assessing the qualitative performance measures, the same illustrative example of “communication between the FE/HE co-located institutions” was critiqued. The discussion was centred on attributes of this qualitative measurement such as the method to be followed, the frequency and people likely to do the measurement. The expert commented:

There is, from memory, the campus management committee which get reports from user groups which gets reports from the ICT, FM or whatever. I think you should tie that frequency with what's already there and don't invent another set of things. Those from memory are quarterly meetings. I think quarterly tests of an annual assessment are probably enough.

The expert suggested that method proposed to assess the qualitative performance measures was applicable. He used the method to measure the level of maturity of “communication between the FE/HE co-located institutions” and commented:

I would have said things are certainly at level 3, there is no doubt about that, and heading towards level four. That's not bad!

The way the quantitative performance measures were assessed was discussed using the same illustrative example that focuses on “space efficiency”. However, the expert made the point that care should be taken when measuring space efficiency in educational institutions because of the different types of spaces need by a variety of subjects. To quote:

What worry in all of this [measurement] is interpretation actually. Textile is a space hungry subject. Mechanical engineering is a space hungry subject. Teaching philosophy is not a space hungry subject. You need a library and a lecture theatre and that's it.

It can be inferred that space efficiency measures can give misleading signs if the subjects they are assessing are not explicitly defined because of the different needs for space of different subjects. Therefore, measuring space efficiency should not be based on the space allocation (or area per student), but on the efficient use of space. The expert said that:

The danger is that they [performance measures] can be interpreted the wrong way. Somebody sits in the Funding Council and says they [co-location institutions] are twice the national average! Well they are doing a different subject that is a space hungry [subject]. The question really is: are they using that space efficiently?

At the end of this session, the comments were collected in a further revision of the framework. This revised framework was presented in Figure 8.3. Changes focused on “Co-location sustainability” and “Collaborative institutional management”. The quantitative and qualitative performance measurement examples in addition to the questionnaire were emailed to the next expert for further investigation.

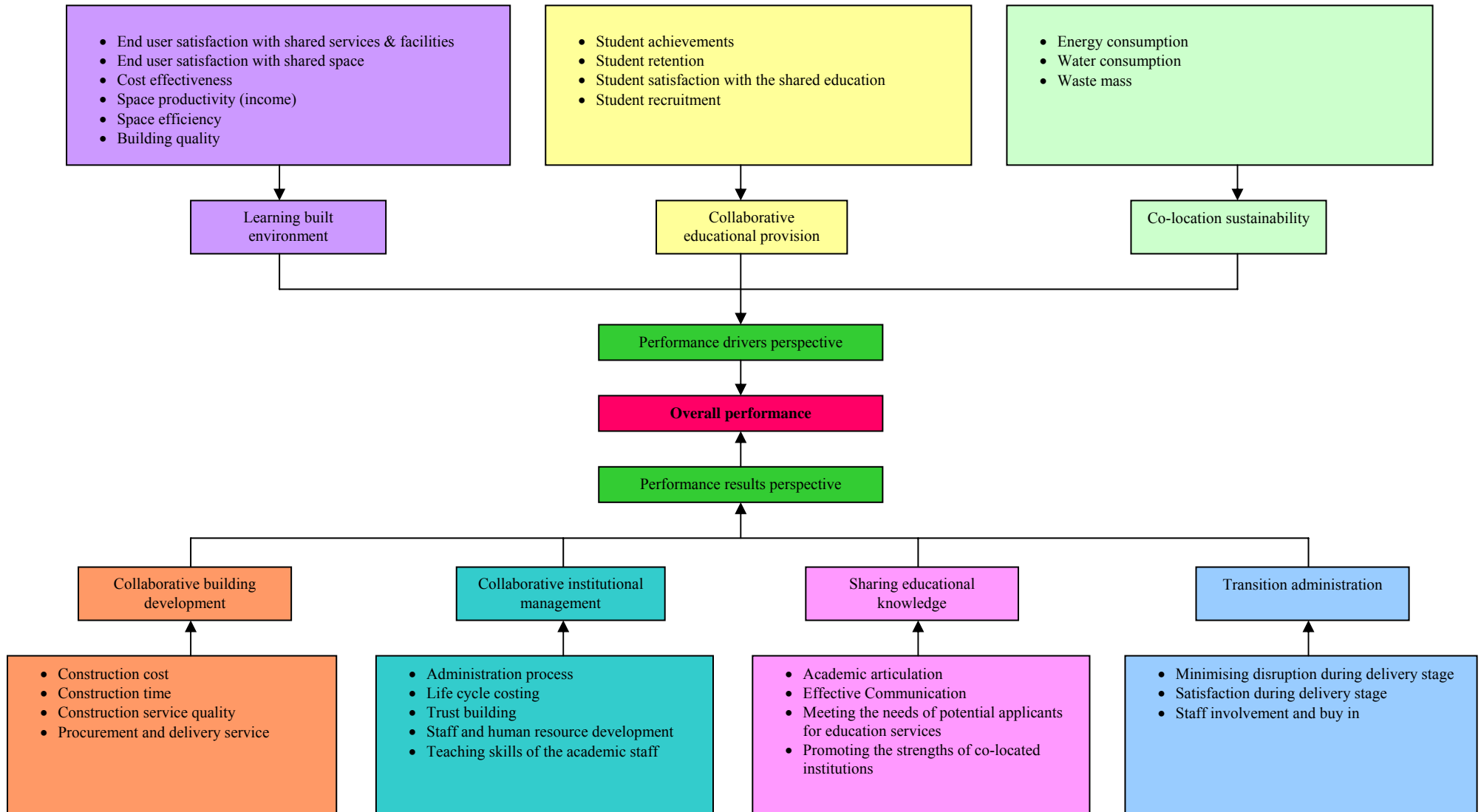


Figure 8.3: The Performance Measurement Modified after the Second Session

8.5.3 Third Session

Based on the outcomes of the second session, the framework was modified and presented in a third session with the third member of the expert panel. This expert's overall impression of the comprehensive performance measurement framework was that it presented a comprehensive view of a co-location project:

[Within] the leading (performance drivers) “Collaborative institutional management” is correct, absolutely vital and perfectly possible to manage. “Transition administration” is OK, I feel comfortable with it. “Sharing educational knowledge” is absolutely right. “Collaborative building development” is fine. And for the lagging (performance results) I think that the divide of this into “co-location sustainability” is absolutely great and “learning built environment” and “collaborative educational provision” seem right to me and understandable.

When reviewing the individual performance measures, this expert showed particular interest in “high quality service process (administration)” in terms of effective collaboration between the management of the co-located institutions to provide educational and support services. To quote:

In terms of performance drivers, within the collaborative institutional management, the administrative process is important in that there is a need to increase effectiveness of the collaboration of management and if it's not there or if that was low then no matter how good all of these were. Success criteria were for me being able to work well, communicate effectively and have a shared understanding with my colleagues [in the other collaborating institutions].

It is important to note that the three criteria that were mentioned by the expert had already been recognised in the maturity models used to assess the qualitative performance measures of “communications between the FE/HE co-located institutions” and “building trust between the FE/HE co-located institutions” in addition to the performance measure that is the centre of the expert's focus, which is “high quality

service process (administration)”. In fact, this insight from this expert enhanced the validity of the measurement framework because these criteria were captured and used in the assessment process.

The assessment of the qualitative performance measures by a maturity model was accepted by this member of the panel. However, the frequency of measurement was commented on:

If we take “communication”, you’ve got a period in the project where this maturation is important if it happens or it’s gonna delay the project and it’s important that it’s established. It has to go through that period where you can understand communication and how communication will happen, how you structure that communication and how you create opportunities for communicating. It must go through that maturation, so I think time is right but I don’t know what the frequency would be and I think you are right in saying it will depend on the project. Then it needs somebody to make a judgement just to know that we got effective communications in place within this project by a certain point in the project plan and then measurement up to that point would become more important and critical. So, it may well be that our frequency changes over time.

In addition, who is taking the measurement was also considered by this expert who suggested that the project manager should perform the measurements. To quote:

It would make sense that it is the project manager. The only thing is that individual is gonna be absolutely critical for communication. So if their communication is not effective, then they are not the best person to be managing it. It’s something done by a project manager but the responsibility lies with the project ownership.

The idea that deciding on the level of maturity of qualitative performance measures could be made by a group of involved people in the project using a focus group technique or similar was agreed by the expert. He said:

It sounds a good idea. I think that would be a valid way of asking people their views of where it [communication] sits. It's qualitative and you're gonna get personal and different views. The group can become part of the maturation process. I think it's a valid way to do it that way.

In addition, the aggregation method was considered a useful tool to be used for internal controlling purposes and also external comparative purposes. The expert stated that:

It provides you with a very useful comparative tool against other projects. I think it has merit, to be able to aggregate. It helps in terms of senior managers. I suspect our senior managers probably would be quite keen to those seven [dimensions] and, then, they can interrogate if they want. This will be a useful summary. I think aggregating up is useful.

The analysis of the comments presented by this expert showed that there was no change needed to the measurement framework at this stage. Therefore, the framework kept the same structure that was presented in Figure 8.3. This version of the developed framework together with the examples of how a quantitative performance measure (space efficiency) and a qualitative performance measure (effective communication) could be evaluated were emailed to the fourth member of the expert panel for their comment at subsequent interview without revision.

8.5.4 Fourth Session

Few shortcomings were identified in the last session. Therefore, the framework, as revised at the end of the second session, was presented in this session.

Benchmarking the performance of the FE/HE co-located institutions against the performance of other further and higher education institutions was criticised. The opinion of this expert is that the measurement shouldn't be used for external comparison as each co-location would be a unique situation that must only be compared against its own targets or against other co-location projects. In other words, the performance of a co-location project cannot be compared with the performance of normal further or

higher educational projects that do not have any form of collaboration or shared campuses:

This is where we're having a problem with that because it wasn't a sector comparison process we were looking for. It's like you're comparing apples with pears kind of scenario. Those performance measures have to be within the co-locating institutions.

The expert stated that the framework should include a performance measure that assesses the capability of the co-located institutions to retain their academic and support staff at their co-located campus. To quote:

The only other one I suppose that may be helpful is "staff retention".

In addition, the expert acknowledged the idea that measuring the performance of co-location is a quite new concept. The expert asserted that the measurement framework should develop further performance measures assessing new aspects of performance which can be experienced by the co-location institution after the shared campus has been in operation for some time. To quote:

It's kind of evolving as a framework and priorities will change just generally as things progress anyway. I think what this will do is to give the co-location institutions a starter. It's like a template as such and there may well be measures to add and take other things out.

The framework is flexible in allowing such future performance measures to be added and accommodated within the comprehensive seven performance dimensions of the co-location overall performance if they emerge. The reason is that the seven dimensions, which the performance measurement framework consists of, are developed based on a list of performance measures that was classified according to the opinions of the FE/HE sector in addition to the opinions of experts who worked in a co-location project.

The "Co-location sustainability" dimension was under the spotlight for its narrowly focused performance measures. The expert commented:

I think the environmental impact is appropriate, but I think it would be value if you have other environmental measures there [Co-location sustainability].

The expert agreed with the other panel members who participated earlier, that measuring energy efficiency and the effective use of water are inadequate to indicate the performance of the “Co-location sustainability” dimension. This expert recommended adding other measures of the environmental impact on community. Moreover, the “Co-location sustainability” needs to expand to include other social and economic aspects. To quote:

To some extent you have to address the social and economic impacts. [However], they are difficult to measure. They will be a challenge.

The expert acknowledged that those impacts are difficult to measure because their definition can be broad and can capture many things the co-location brings into the community.

The way by which the qualitative performance measures were assessed was explained in more detail as this expert further highlighted difficulty in understanding the titles of the each level of the five-level process maturity model. The expert said:

On the maturity models, I just wondered in terms of these titles or headings whether there would be definitions for each one. In some aspects they are probably quite clear and quite straightforward but I think it might be helpful just to clarify that for people who are just looking on this maturity model and may be haven't ever seen something like this before.

The comments made by the expert were analysed and incorporated into the measurement framework. The modified framework, presented in Figure 8.4, and the examples of the quantitative and qualitative performance measurement were emailed to the fifth member of the expert panel for comment.

Chapter 8: Validating the Measurement Framework

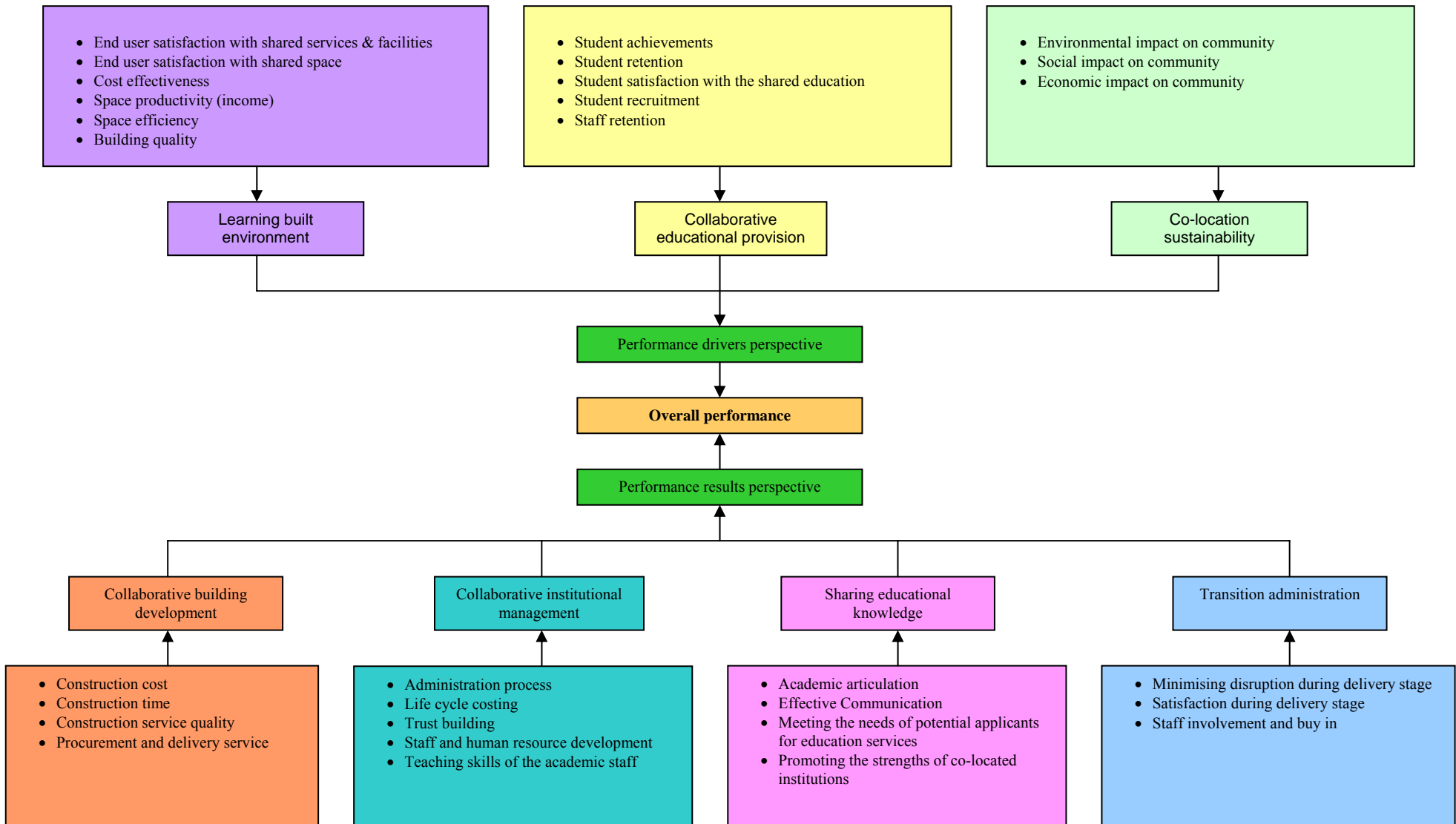


Figure 8.4: The Performance Measurement Framework Modified after the Fourth Session

8.5.5 Fifth Session

At the start of this session, the modified structure of the measurement framework was explained. The expert was satisfied with the accuracy and appropriateness of the framework structure. She emphasised that the framework should have the ability to catch the interest of people who are using it. To quote:

I think that structure is completely right and completely appropriate and I think it's usable. I think that relies on people engaging with this initial front sheet and taking the time and effort to go into the substance behind it. I think it is important that this [framework] should be in itself a stand alone piece of information. For example a chair of a board of a principal, all that they are going to look at is that and they say yes or no to engaging with this [framework] and it will be the vice principal or director of estates then going down to the next level..... I am happy with the whole structure and the way it's been developed. I think it's developed into a very worthwhile comprehensive tool which colleges and universities can use.

This expert considered that the layout of the measurement structure has a significant impact on summarising the objectives that the co-location project is trying to achieve. According to the expert, the structure should not be difficult to read and understand so that people can interpret the measurement framework and use it correctly. In this regard, the expert said:

I think that this needs to have a structure that people can automatically realise that's primary, that's secondary and that's tertiary. I think we know how to navigate it because we have been involved and have underlying understanding but I would be interested to put this in front of somebody who's never been involved in a collaborative project, and who is not necessarily process driven, may be policy driven, and get their interpretation of this.

There is nothing fundamentally wrong with anything. It's all good. I think that by changing a little bit of language it should be self evident and clearly summarise what we were doing.....I think what we've been taking about here is tweaks around edge. It's nice to have it all in front of you because you can then understand it and read it. It becomes much more real than being a theoretical exercise.

At the end of this session, the comments were used to further revise the framework. This revised framework was presented in Figure 8.5. Changes focused mainly on the layout and of the framework to capture the attention of its potential users.

In correlation with principles of the Delphi method process, the current iteration of the measurement framework was circulated to all expert panel members. There were no further comments on the modified framework and therefore the process of the Delphi method stopped as the researcher considered that consensus was achieved.

The Delphi method demonstrated that the repeated sessions refined the experts' responses and that the framework structure, performance measures and the methods of measurement were accepted and validated.

The following tables illustrate the criteria by which the framework structure, performance measures and the methods of measurement were judged by the panel of experts. In addition, these criteria were used to express the level of consensus among the experts. They were selected from the literature review at an early stage of this study. Defining these criteria was explained in Chapter 2.

The complete results at the end of the fifth session were emailed to all the members of the expert's panel for further observation and suggestions. The panel had no further particular comments to add and the researcher considered that a consensus had been reached.

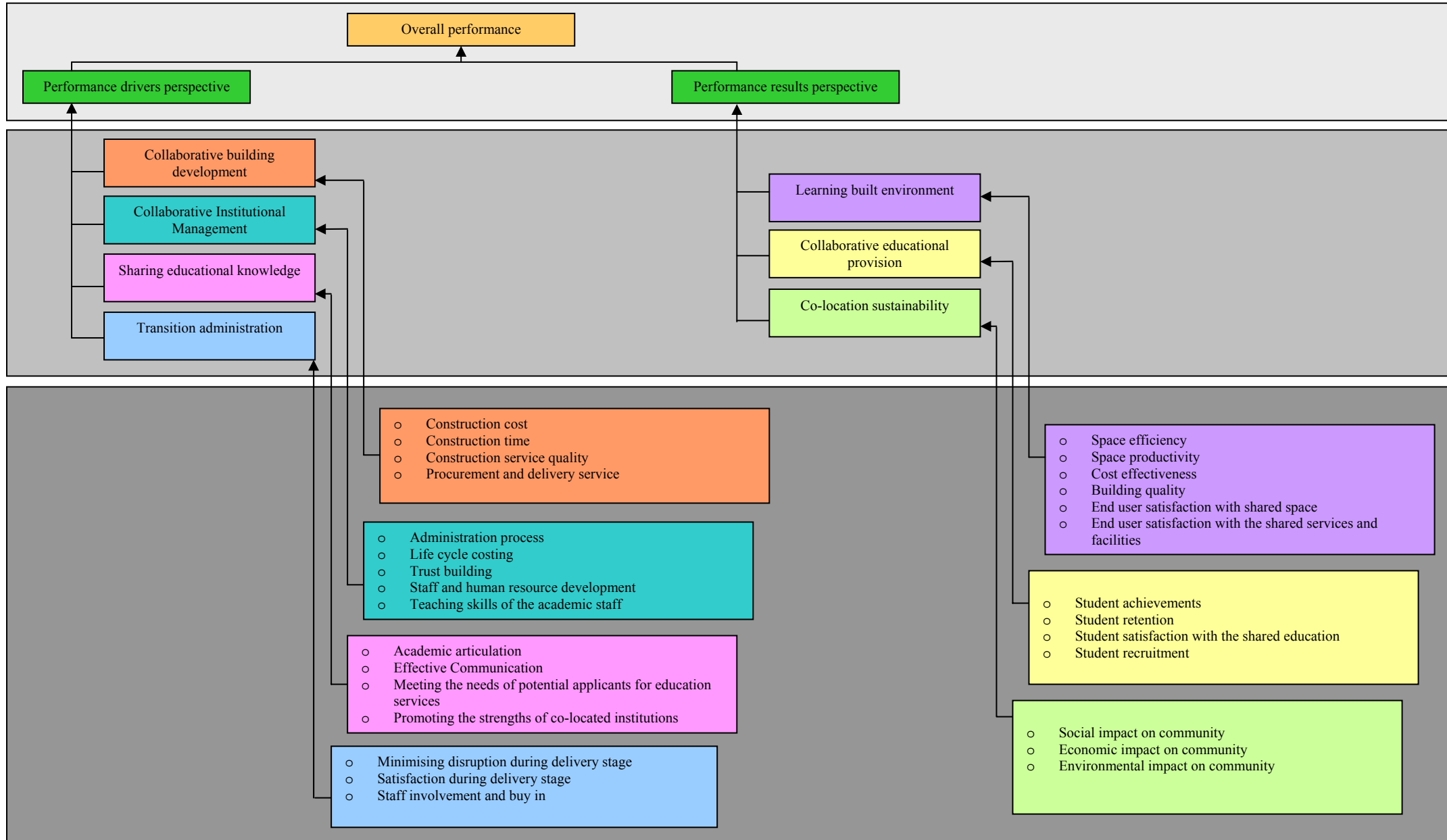


Figure 8.5: The Performance Measurement Framework Modified after the Fifth Session

8.6 The Validating Questionnaire

As mentioned earlier, the validation process comprised of the Delphi survey and a complementary questionnaire, completed by each panel member after their critical examination of the framework in interview with the researcher. This questionnaire comprised six sections (Appendix E). Section one included questions about who the members of expert panel are. Sections two, three and four included closed questions measured using a ten-point Likert scale which required the experts to rate the structure of the measurement framework, performance measures and measurement method against the criteria representing the performance of an ‘ideal’ framework developed in Chapter 2. Through sections five and six of the questionnaire, the panel members were asked to give weightings to the two performance perspectives (performance drivers and performance results) and the performance dimensions within these performance perspectives.

8.6.1 Questionnaire Sample

Members of the expert panel formed the sample who participated in the questionnaire. This questionnaire was completed after each session and was sent back to the researcher. The list of participants is presented in Table 8.2.

Member's role	Organisation
Director of Planning	Heriot-Watt University
Director of Campus Services (Borders Campus)	Heriot-Watt University
Assistant Principal	Borders College
Policy Officer	Scottish Funding Council
Assistant Director of Capital Projects	Scottish Funding Council

Table 8.2: Questionnaire participants

Those participants were selected for the same reasons of participation in the Delphi method. They were involved in a FE/HE co-location project and have the experience of managing such projects. They represented the co-location educational institutions and the funding body from the Heriot-Watt University and Borders College co-location project; the project that was used at the first phase of this study.

8.6.2 Framework Structure Rating

Section one of the questionnaire focused on exploring the panel of experts' opinion about the extent to which the performance measurement is comprehensive, balanced and adaptable (Figure 8.6). These criteria represent characteristics developed from literature on the subject of performance measurement (recall Chapter 2).

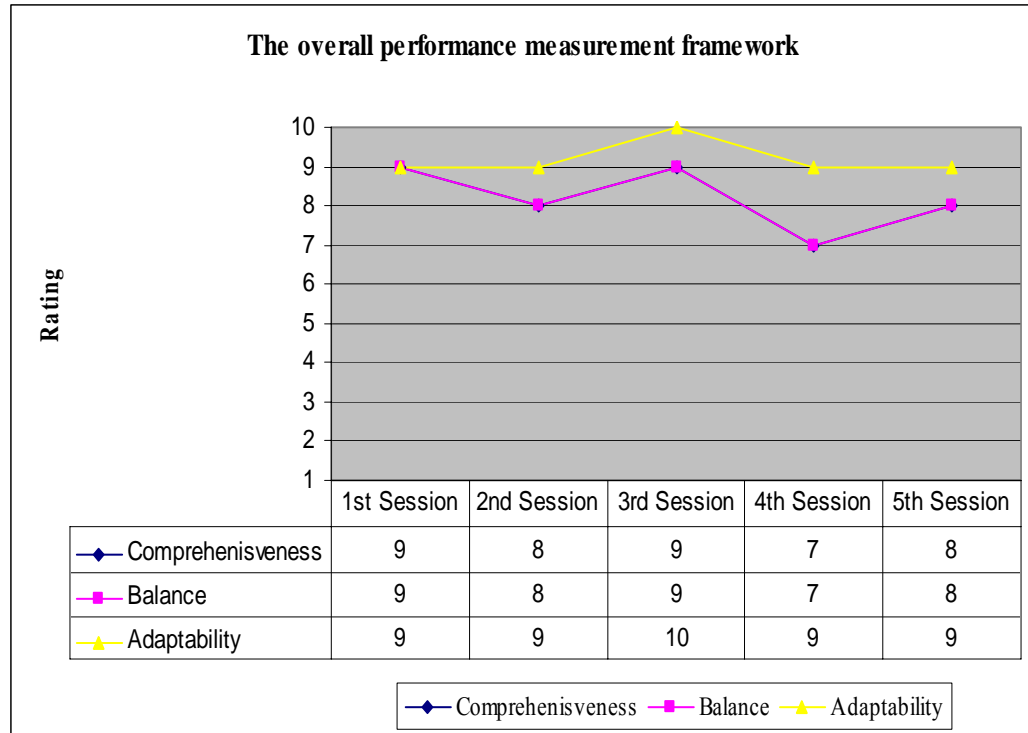


Figure 8.6: Ratings of Overall Performance Measurement Framework

This figure reveals that opinion of the panel changed slightly over the process of validation. However, the panel thought that the structure of the performance measurement framework, to a high extent, met the three criteria of covering a range of performance criteria that are linked to the needs of students, staff and other stakeholders (comprehensiveness), including a variety of quantitative and qualitative assessment of the co-locating project success (balance), and the ability of the measurement framework to be used for different FE/HE co-location projects (adaptability).

8.6.3 Performance Measures Rating

Section two of the questionnaire focused on exploring the panel of experts' opinion about the extent to which the performance measures are relevant, understandable, useful and focused on continuous improvement adaptable (Figure 8.7).

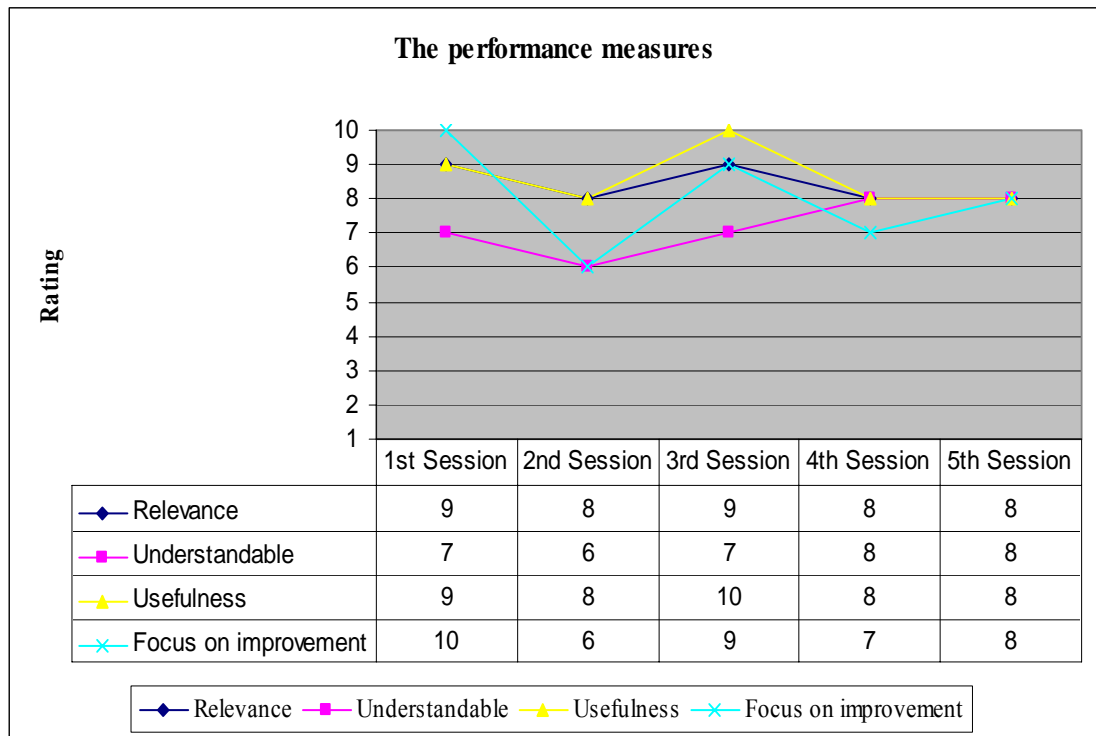


Figure 8.7: Ratings of the Performance Measures

This figure illustrates that throughout the process of the Delphi method, the panel of experts strongly agreed that the proposed performance measures in the framework met the criteria of reflecting the strategy of the FE/HE co-location institutions relating to the co-location project (relevance), being clearly defined and easy to understand (understandable), and providing useful information (usefulness). These criteria describe the characteristics of performance measures, developed from performance measurement literature (recall Chapter 2). The “focus on improvement” criterion showed fluctuating ratings. This criterion concentrates on promoting the accurate actions to achieve project and organisational objectives. The qualitative performance measures particularly encourage the co-location institutions to continuously improve and progress through the five levels of maturity.

8.6.4 Measurement Methods Rating

Section three of the questionnaire focused on exploring the panel of experts’ opinion about the extent to which the measurement methods are simple, clear, feasible and applicable (Figure 8.8).

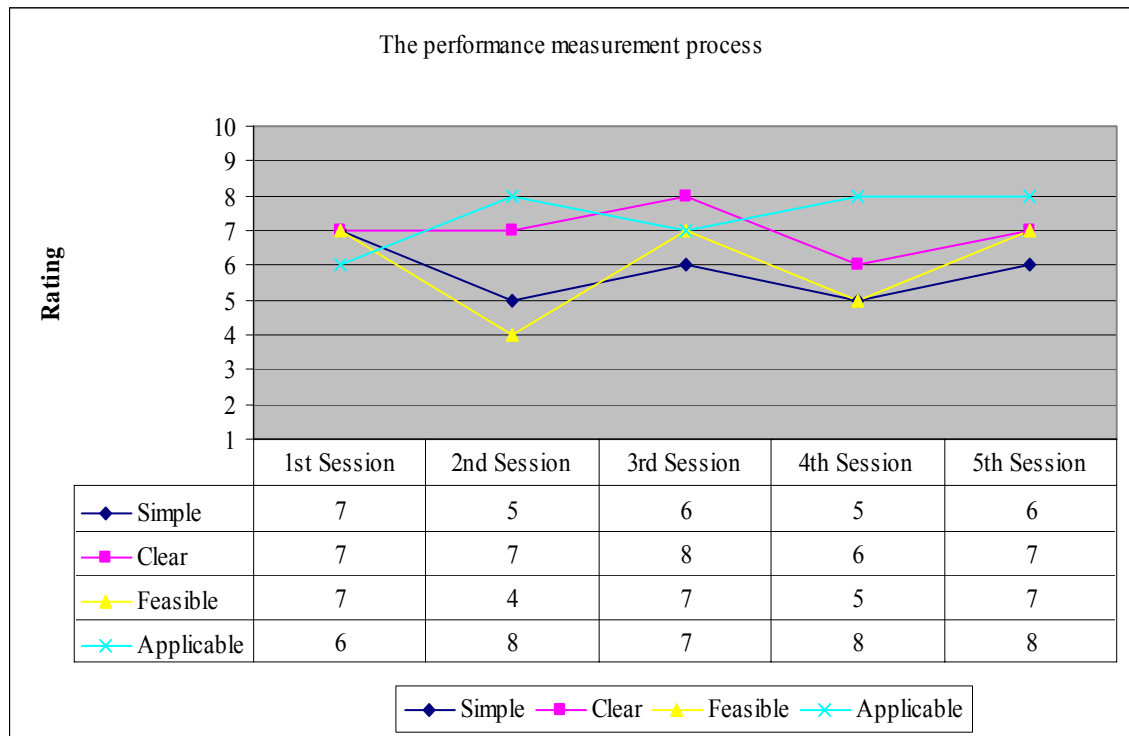


Figure 8.8: Ratings of the Performance Measurement Methods

The figure shows that the experts strongly agreed that the methods of measuring the FE/HE co-location project performance using the developed measurement framework can be implemented. Moreover, they agreed that the measurement methods are based on an explicitly defined method of measurement and sources of data (clarity). Conversely, the experts' response showed variance when rating the proposed performance measures against the criteria of "effectiveness". Effective performance measures means that they are not just another task imposed on an already busy schedule of the people taking the measures. In other words, the measurement methods should depend on the data and information that are generated as part of the co-location project activities.

8.6.5 Weightings of Performance Perspectives

Section five of the questionnaire asked the experts to weight the two performance perspectives. The results of this rating are shown in Figure 8.9.

In the previous phase of the study, exploratory factor analysis was used to produce weightings of different performance aspects including the two performance perspectives. These weightings of the performance perspectives were calculated based on the views of the entire FE/HE sector in Scotland (Chapter 7). A comparison was

made between the weightings of the performance perspectives produced earlier with the average weightings produced by the panel of experts at this phase (Figure 8.9).

Overall performance	Performance drivers	40%	60%	45%	60%	40%	49%	51%
	Expert ratings	1 st Session	2 nd Session	3 rd Session	4 th Session	5 th Session	Expert Average	FE/HE sector
	Performance results	60%	40%	55%	40%	60%	51%	49%
	Expert ratings	1 st Session	2 nd Session	3 rd Session	4 th Session	5 th Session	Expert Average	FE/HE sector

Figure 8.9: Expert and Sector Rating of the Performance Perspectives

The comparison showed that the FE/HE sector sample expressed a near-consensus view of the performance perspectives (Figure 8.9). This table shows the weight allocated to the performance drivers perspective in the overall view of “overall performance” is nearly equal to that of the performance results perspective. This result corresponds to the weightings assigned to the two performance perspectives of the European Foundation for Quality Management (EFQM) Excellence Model which formed the basis of the initial synthesis of this framework from literature in phase one of the study.

8.6.6 Weightings of Performance Dimensions

Section six of the questionnaire included questions that requested the experts to weight the performance dimensions within both performance perspectives. The results of this rating are shown in Figures 8.10 and 8.11. These weightings were also compared with those produced in the previous phase on using the speculative opinions of wider FE/HE sector.

Within the performance drivers perspective, the expert average weightings showed that the performance dimensions have the following ranking: Collaborative building development, Collaborative institutional management, Sharing educational knowledge, Transition administration (Figure 8.10).

Performance drivers	Collaborative building development	30%	40%	20%	25%	30%	29%	31%
	Expert ratings	1 st Session	2 nd Session	3 rd Session	4 th Session	5 th Session	Expert Average	FE/HE sector
	Collaborative institutional management	30%	20%	35%	30%	20%	27%	28%
	Expert ratings	1 st Session	2 nd Session	3 rd Session	4 th Session	5 th Session	Expert Average	FE/HE sector
	Sharing educational knowledge	30%	15%	30%	15%	30%	24%	25%
	Expert ratings	1 st Session	2 nd Session	3 rd Session	4 th Session	5 th Session	Expert Average	FE/HE sector
	Transition administration	10%	25%	15%	30%	20%	20%	16%
	Expert ratings	1 st Session	2 nd Session	3 rd Session	4 th Session	5 th Session	Expert Average	FE/HE sector

Figure 8.10: Expert and Sector Rating of the Performance Drivers Dimensions

The same figure demonstrated that the weightings produced by the wider (yet inexperienced in co-location) sector again exhibited a near-consensus view of the performance drivers dimensions. The order of the performance drivers dimensions by both the experts and FE/HE sector matched. In addition, the expert average weightings were nearly the same as those weightings produced by the FE/HE sector.

The expert average weightings and the sector weightings of the performance results perspective showed that there was a slight difference between the panel of experts and the sector in ordering the performance results dimensions. While the experts showed more emphasis on the “collaborative educational provision” dimension than on the “learning built environment” dimension, the sector showed the opposite (Figure 8.11). The expert panel and the wider sector showed similar views toward the two performance perspectives with both getting equal percentages (Figure 8.11).

This difference between the views of the FE/HE wider sector and the panel of experts could be explained by the fact that the FE/HE sector sample in Scotland sector looked at the co-location project experience from a distance whereas the experts looked at it from inside, which could not necessarily represent the right view.

Performance results	Learning built environment	50%	30%	40%	30%	40%	38%	43%
	Expert ratings	1 st Session	2 nd Session	3 rd Session	4 th Session	5 th Session	Expert Average	FE/HE sector
	Collaborative educational provision	30%	50%	30%	40%	50%	40%	36%
	Expert ratings	1 st Session	2 nd Session	3 rd Session	4 th Session	5 th Session	Expert Average	FE/HE sector
	Co-location sustainability	20%	20%	30%	30%	10%	22%	21%
	Expert ratings	1 st Session	2 nd Session	3 rd Session	4 th Session	5 th Session	Expert Average	FE/HE sector

Figure 8.11: Expert and Sector Rating of the Performance Results Dimensions

This phase demonstrated that, apart from one difference between the expert average weighting and the wider FE/HE sector weightings, the panel of experts (who have experience in managing FE/HE co-location projects) and the wider sector (formed by people performing similar roles within their organisations) have expressed similar views regarding how a FE/HE co-location project facilitated by a construction project can be considered successful. In other words, the Delphi survey supported the findings of the exploratory factor analysis performed at the last phase of the study. Hence, the findings of the exploratory analysis were meaningful and were produced correctly.

The above discussion leads to emphasising the fact there is correlation between the gathered data by people who have not been involved in a FE/HE co-location project and those who have. On this basis, the weightings needed to aggregate the performance measures, dimensions and perspectives into a single index that represents the overall performance of the FE/HE co-location project can be produced depending on the views of the expert panel or the views of the wider FE/HE sector. In addition, the weightings that resulted from factor analysis were produced with more rigour. Therefore, for this study, the weightings based on the wider sector were used for aggregation.

Few changes were made at this phase. These changes focused on the performance measures within three dimensions: Collaborative institutional management, Collaborative educational provision and Co-location sustainability. Thus, average the performance measures weightings were calculated within these dimensions. The measurement framework with the weightings is presented in Figure 8.12.

Chapter 8: Validating the Measurement Framework

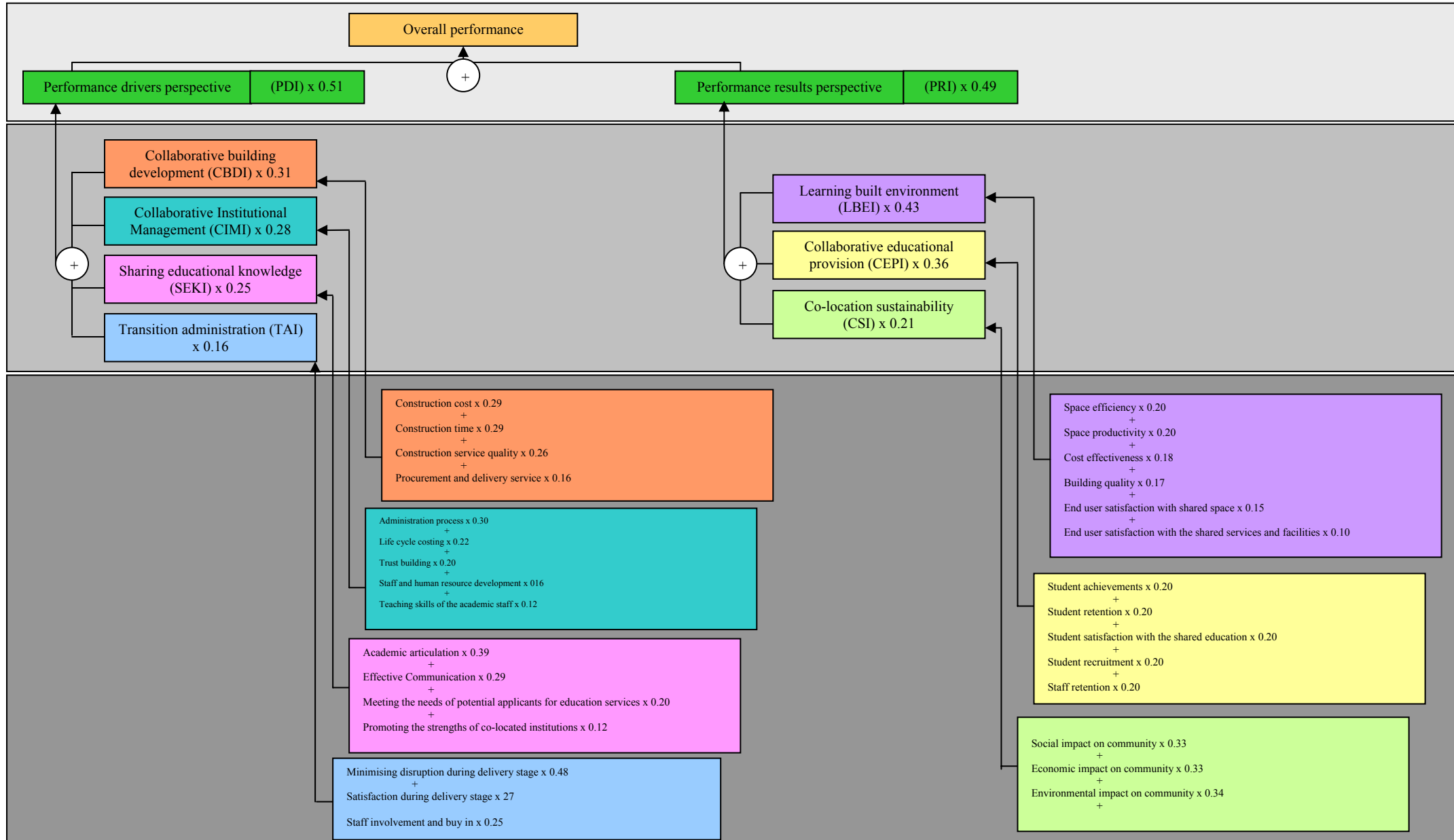


Figure 8.12: The Performance Measurement Framework with the Weightings

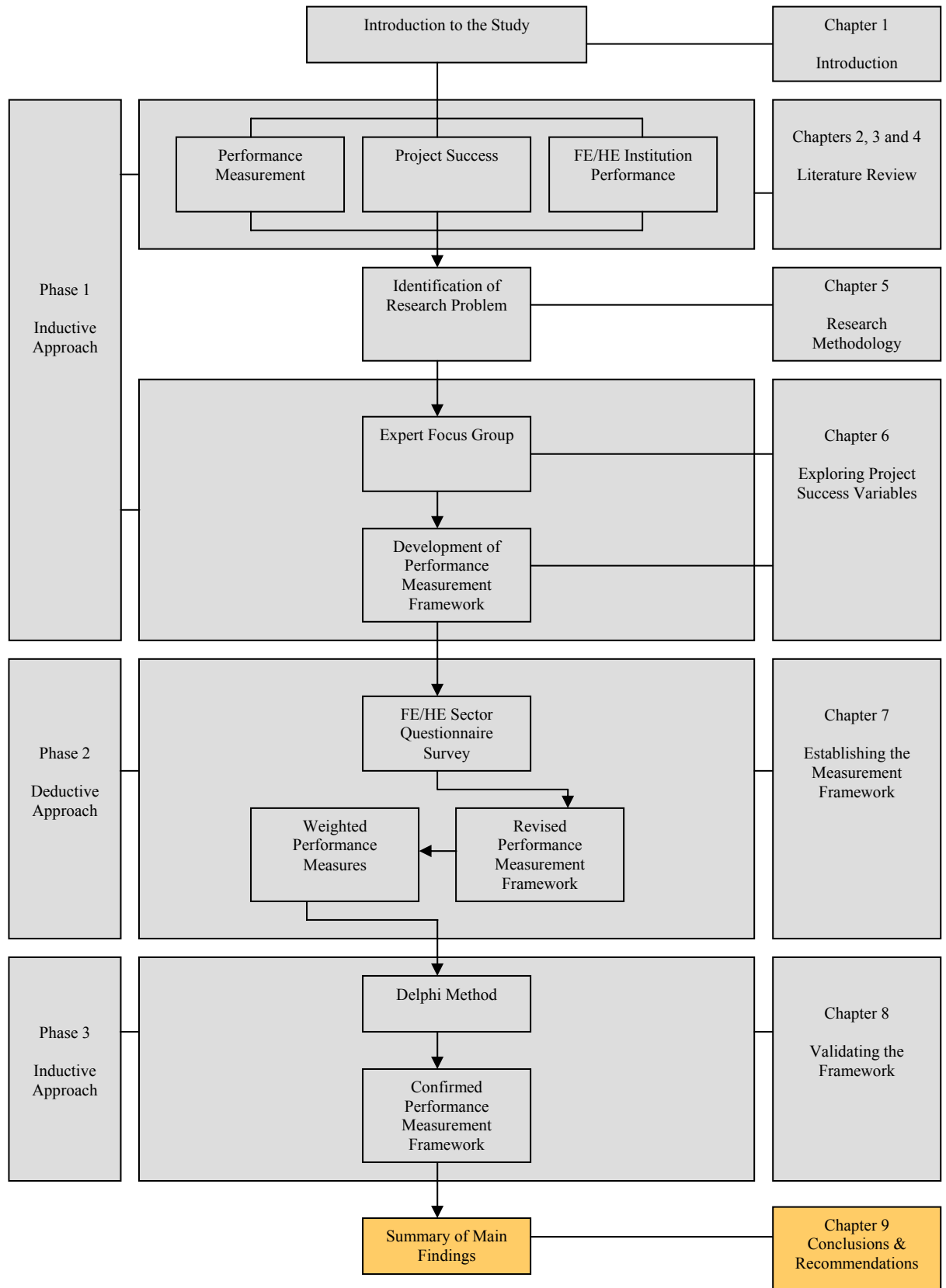
8.5 Conclusion

The Delphi method was used to revise the outcomes of the questionnaire survey carried out at the previous phase of the study and to capture suggestions relating to the development of the comprehensive performance measurement framework for FE/HE co-location projects. The experts at this phase offered their judgements towards a number of issues in a number of sessions forming one complete round. The process of the Delphi method was performed in one round as it stopped at the beginning of round two.

The use of the Delphi method to validate the comprehensive measurement framework resulted in a final modified version on the basis of the suggestions made by all members of the experts' panel. The different sessions held with those members assisted in refining the framework where a number of performance measures were added, altered and eliminated.

The Delphi method showed that the structure of the measurement framework which comprises of three hierarchal levels developed at the previous phase of this research was valid. In addition, it demonstrated that the method of aggregating the different levels of the performance measurement hierarchy was also valid and applicable. The Delphi method proved that the developed framework achieved the criteria recommended for ideal framework structures, performance measures and the methods of measurement. Moreover, it demonstrated that FE/HE sector level people who did not have experience of managing FE/HE co-location projects but were in positions similar to those who were involved in such type of project, provided reasonable judgement about how a FE/HE co-location project can be successful.

Chapter 9: Conclusion and Recommendations



Chapter 9 Conclusions and Recommendations

9.1 Introduction

This thesis has been developed on the basis of a study into how FE/HE co-location projects are measured. There is a growing interest in both the academic literature and practice on measuring performance. When further and higher education institutions collaborate to undertake a co-location project that involves building or expanding existing buildings to accommodate new shared activities, services and/or facilities, they face the problem of how to measure and consequently manage the performance of the co-location. These institutions require a comprehensive view of key areas that need to be examined in detail. Addressing these problems formed the subject area of this study.

9.2 Revisiting the Research Aim

This research was conducted to explore how the success of FE/HE co-location projects facilitated by a construction project can be defined and the way by which the performance of such projects can be measured. Researchers have shown interest in defining project success in that this concept has been approached and defined from different perspectives with different interests. Consequently, a study to investigate this problem in detail was needed. Therefore, the aim of the study was:

To develop a comprehensive performance measurement framework for FE/HE co-location projects to provide further and higher education institutions with a structured way of measuring the performance of co-location projects.

With respect to the research aim, the findings of the thesis explain the performance measurement framework and the methods of measurement and aggregation according to the project definition adopted at the start of this study. This definition was introduced by Kelly (2005, p12) who viewed a project as an “*investment of resources for return.*” Recognising that a project is undertaken to add value to the core business of the initiating organisation, this definition implies that a project’s full potential can only be realised some time after its completion. The measurement framework accordingly allows the performance of FE/HE co-location projects to be assessed in the short, medium and long term.

These findings stand on the existing literature that underlines the significance of defining project success. The literature showed particular emphasis on expanding success criteria to address what is considered to contribute to project success in the medium and long terms. Through the analysis and discussion of the literature, performance measurement and performance management processes have been differentiated, clarifying these concepts that are not clearly distinguished in the literature. To do this, the empirical findings also included information about the influences of the performance measurement and performance management processes on performance, reflecting the increasing debate in existing literature regarding the merit of measuring and managing performance. The concept of performance reporting emerged as a key part of understanding performance measurement and performance management concepts.

The development of the overall conceptual framework for measuring the performance of FE/HE co-location projects utilised the focus group method as a preliminary step in the study to explore, gain more understanding and gather insights into the performance criteria that characterise successful FE/HE co-location projects facilitated by a construction project. The focus group workshop established a conceptual performance measurement framework which integrated construction project success dimensions, criteria and corresponding measures with FE/HE performance measurement dimensions, criteria and measures. They confirmed the framework's hierarchal structure and emphasised the suitability of many suggested performance measures to assess the performance of the FE/HE co-location project. The participants identified success criteria and performance measures additional to those developed from the literature which they considered vital for an FE/HE co-location project. Those newly suggested measures focused mainly on areas of transition arrangements and collaboration (recall Chapter 6). The participants' suggestions were integrated into the conceptual framework to conclude with a validated measurement framework.

Surveying the opinions of the full further and higher education sector, as potential clients of the developed framework was necessary to explore their perception regarding how FE/HE co-location project can be successful. Findings revealed further performance drivers perspective of the measurement framework. Based on data analysis, the performance drivers perspective included four performance dimensions

instead of three dimensions identified in the preceding literature review. These dimensions are: collaborative building development, collaborative institutional management, sharing educational knowledge and transition administration.

The wider FE/HE sector's views of performance dimensions were confirmed by the focus group participants when considering the performance results perspective of the measurement framework. Analysing the collected data showed that the performance results perspective comprises three performance dimensions: learning environment, shared educational support, and sustainability.

The resulting measurement framework was validated using the Delphi method, a technique through which a group of experienced people are consulted about an issue in an iterative manner until a consensus view is achieved. This method was followed to validate and establish the structure of the performance measurement framework and the methods of measurement and aggregation within it. The use of the Delphi method resulted in a final modified framework on the basis of the suggestions made by all members of the experts' panel. These suggestions and feedback were collected through iterative sessions held with those members. They assisted in refining the framework where a number of performance measures were revised. The final version of the measurement framework is illustrated in Figure 9.1. The Delphi method showed that the structure of the measurement framework which comprises of three hierarchal levels developed at the previous phase of this research was valid. In addition, it demonstrated that the process of aggregating the different levels of the performance measurement hierarchy was also valid and applicable. Moreover, the Delphi method proved that the criteria recommended for ideal framework structures, performance measures and the process of measurement, have been achieved. The resulting performance measurement framework – with validated content and methods of use – is presented in Figure 9.1.

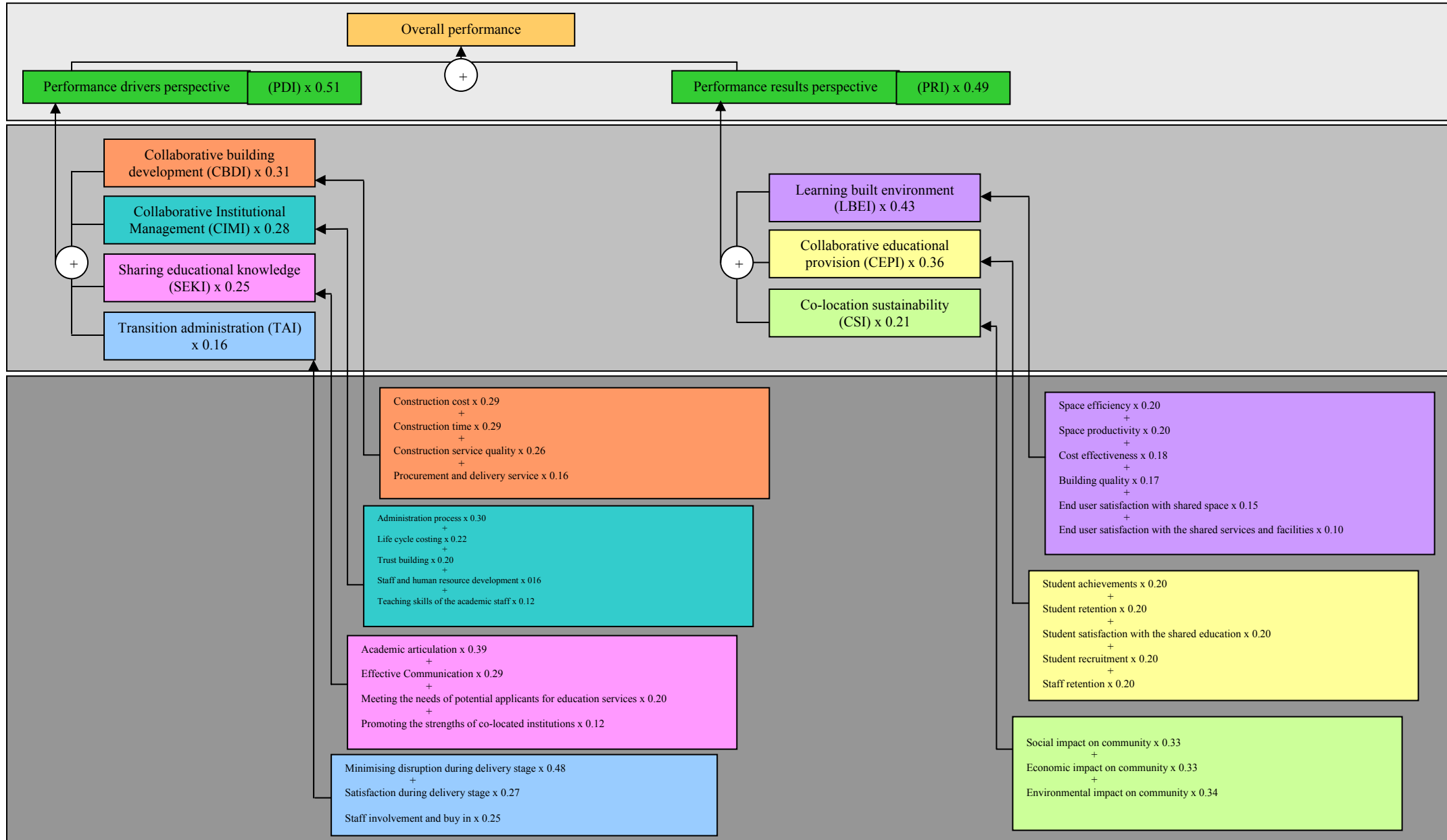


Figure 9.1: The Performance Measurement Framework for FE/HE Co-location Projects

9.3 Revisiting the Research Objectives

A number of objectives were set to achieve the research aim. These objectives were addressed as follows:

9.3.1 Objective 1

To explore the performance measurement frameworks used to assess general business performance.

The literature showed that performance frameworks have been developed to assist organisations by defining areas that are vital for business success and by identifying performance measures that can be used to assess business performance in those areas. Measurement frameworks can also be used to express the relationships among these vital dimensions of business performance and among their performance measures. It has been found that performance measurement frameworks developed from single-dimension frameworks that rely on monetary-based measures to those that have the characteristics of multi-dimensional measures that provide a balanced assessment of the business and promote continuous improvement. Furthermore, literature showed that a positive correlation could exist between the use of balanced set of measures and performance improvement. Updating and improving methods of performance measurement have, over time, required academics and professionals to develop more sophisticated performance measurement frameworks such as:

- Pyramid of financial ratios (Du Pont, 1910)
- Performance measurement matrix (Keegan *et al.*, 1989)
- Performance pyramid (Cross and Lynch, 1991)
- Results and determinants model (Fitzgerald *et al.*, 1991)
- Balanced scorecard (Kaplan and Norton, 1992)
- European Foundation for Quality Management Excellence Model (EFQM, 1992)
- Input, processes, outputs and outcomes framework (Brown, 1996)
- The performance prism (Neely *et al.*, 2000)

Apart from the Du Pont pyramid of financial ratios, the other performance measurement frameworks are similar in that they help organisations improve their performance by involving different organisational structures in the measurement process. In addition, performance frameworks such as the balanced scorecard and the European Foundation for Quality Management (EFQM) Excellence Model place emphasis on organisational continuous improvement. Moreover, some performance measurement frameworks such as the EFQM Excellence Model and the results and determinants model developed by Fitzgerald *et al.* (1991) explicitly consider that the measured performance has two perspectives: performance enablers (or determinants) and performance results. This concept was adopted by this study.

The characteristics of the structure of the existing measurement frameworks, performance measures and the measurement processes were systematically reviewed as presented by many authors on the subject of performance measurement. The resulting synthesis was presented in Section 2.5. The summarised characteristics of measurement frameworks, performance measures and the measurement process provided the characteristics of an effective performance measurement framework, against which the findings of this study were validated.

9.3.2 Objective 2

To identify what constitutes “successful” projects by investigating success criteria and dimensions.

The concept of project success has developed over the years and so have success criteria. This study established that project success means different things to different people and that there was a constant transformation in perceiving project success over the history of the field. Early studies on the subject focused on finishing the project to its planned schedule, within budget, and in accordance with agreed specifications. Understanding of project success has since evolved to include a number of relevant concepts that shaped project success criteria and success factors. These concepts include the following:

- The priority of the project in an organisation’s strategic agenda.
- The importance of the client (or the end-user) perspective.

- Distinction between project management success and project success.
- Extending the concept of project success to cover intangible perspectives of the implementation “process” such as psycho-social outcomes.
- Distinction between “project task outcomes” and “project psycho-social outcomes”.
- Distinction between strategically managed projects and operationally managed projects.
- The link between the creation of the investment assets (the “project”) and the consequent operation of those assets to attain business benefits.
- Distinction between the “project” macro and micro perspectives.
- A focus on time-based criteria that extend the conventional project lifecycle into achieving business success.
- The place of the “project” within the client’s core business.

9.3.3 Objective 3

To review and examine how performance is measured in the construction industry.

Definitions of project success showed a prominent link with the notion of achievement. This achievement can be represented in different terms such as technical, financial, social, and professional issues. In construction, a sector that has been criticised for poor performance and limited innovation, organisations have attempted to adopt best practices in business performance measurement such as the balanced scorecard and other quality based frameworks such as the EFQM Excellence Model in addition to the key performance indicators (KPI) for use in the UK construction industry (recall Chapter 3). These prior applications have attempted to improve the industry’s performance on both organisational and project levels. However, the literature review showed that the resulting methods of measurement construction project performance did not explicitly include elements that express the long term success of the business facilitated by the construction project. The required view can be provided by adopting the “wider” project success concept also present within the literature. This concept expands the definition of project success beyond delivery of the constructed facility (i.e. the project’s product) into the performance of that product in use. This necessitates exploring the nature of the business the construction product is required to facilitate to

identify areas that are critical to the success of that business by shedding light on the way that business measures its performance. This issue is significant and needs to be addressed properly to define project success.

9.3.4 Objective 4

To explore the nature of the FE/HE educational provision challenges facing FE/HE institutions and ways to measure the performance of FE/HE institutions.

The further and higher education sectors produce value through ‘knowledge products’. The further education sector has developed from providing technical education on a part time basis for technicians and craftspeople to currently offer vocational education and training generally on a day release basis for students who are 16 years old or older (Huddleston and Unwin, 2007). On the other hand, the higher education sector focuses on providing courses that lead to degree qualifications, advancing knowledge and understanding through teaching and research activities, and contributing to an economically successful and culturally diverse nation (HEFCE, 2009).

The created value will not only benefit students who receive educational services, but it will also have impacts on other stakeholders such as parents, potential employers and society, who also have an interest on the appropriateness and suitability of education to their requirements. The resulting challenges that face further and higher educational institutions need to be addressed. They are mainly linked to the quality of education provision and the student experience.

Existing approaches to measuring the performance of education institutions were found to focus on performance measures related mainly to financial resources, teaching and research income and expenditure (Williams, 2003). The literature showed that the focus moved to centre on broader issues concerning quality of educational services to ensure that institutions are delivering the required educational services while meeting the expectations of stakeholders. Previous authors applied different quality dimensions from non-academic fields into the education sector while also emphasising quality criteria specific to the education sector. Examples of these educational institution performance measurement frameworks were reviewed and synthesised. The synthesis

organised measurement of educational institution performance into five dimensions: Financial and estates and infrastructure; Customer; Process; Learning and growth; and External impact.

9.3.5 Objective 5

To propose methods to measure the quantitative and qualitative aspects of co-location project success.

The performance measures in the FE/HE co-location measurement framework fell into two types: quantitative and qualitative performance measures. The quantitative performance measures were those measures that can be directly assessed using numerical values (Chan *et al.*, 2003, p.636). Therefore, those quantitative measures were assessed using numerical data describing: different spaces of the co-location; number of students and staff; project costs and time; and so forth. These data are available in sources such as Educational Management Statistics (EMS), e-Mandate, Higher Education Statistics Agency (HESA) and the construction project documents of the co-location.

The other type of performance measure is qualitative. This type of measure cannot be assessed by assigning numerical values (Chan *et al.*, 2003, p.636). There are two ways to assess the qualitative performance measures in the measurement framework. The first is by using judgement scales such as the Likert scale. This way of assessment was applied to performance measures that are not process based and which relate to levels of satisfaction. The second way of assessing the qualitative performance measures was applied to those measures that are process based. This second method of measurement utilises five-level set of criteria to structure a “process maturity model.” The model describes the characteristics of practice that typify varying sophistications of educational institution performance with regard to the area that a particular performance measure is assessing. FE/HE co-location institutions aiming to measure their success in that aspect of organisational function need to assess their current performance to determine its level of maturity against proposed sector norms.

9.3.6 Objective 6

To suggest a practical way to aggregate a set of performance measures into a single indicator.

Performance measures can be aggregated by combining a group of variables into a single index. This aggregation is performed using mathematical methods that allow a group of individual variables representing different concepts to be combined even though they generally do not share the same units of measurement. Aggregation requires assigning weights to the variables. In this study, factor analysis was used as a weighting technique. Factor analysis was applied to the performance drivers measures and the performance results measures. Following this, groups of performance measures within each performance perspective were aggregated to provide performance dimension indices (recall Figure 9.1). Performance dimensions were aggregated using the same method to provide a performance drivers index and a performance results index. Finally the two performance perspective indices were combined into an overall performance index.

9.4 Contributions to Knowledge

The main contribution of the study is the development of a comprehensive performance measurement framework for FE/HE co-location projects facilitated by construction projects (Appendix F). The research study was novel because it addressed how co-location projects can be considered successful when linking project success criteria with FE/HE institution performance. The study provides further and higher education institutions and educational funding organisations with a structured way of measuring the performance of their co-location projects. The developed framework emphasised that the “project” is a way of achieving organisational objectives by including performance measures related to long term organisational success. This confirms the concept that was introduced by Kelly (2005) through which he considered that projects are initiated to add value to the core business of the initiating organisations. It also underlines the view of Turner (2009) which considers the “project” to be a vehicle for achieving business objectives. Above all, it emphasises that FE/HE co-location project success expands beyond the completion of construction to include performance dimensions and measures that relate to the performance of the constructed campus, the

performance of its inhabitants, and the impact that the FE/HE co-location has on its local community. To summarise, this research study contributes:

- A measurement framework emphasising the performance dimensions that FE/HE institutions should focus on when collaborating to undertake a co-location project successfully;
- An innovative way to measure the qualitative performance measures based on identifying the level of maturity of the processes they represent;
- A systematic approach to quantifying the qualitative performance measures; and
- A structured approach to integrate groups of performance measures and dimensions into performance dimension indices, performance perspective indexes and an overall performance index.

9.5 Benefits for the FE/HE Sector

The performance measurement framework was developed to provide higher and further education institutions with a useful tool to guide their consideration of collaboration and co-location. It has been published on the Scottish Funding Council website as received guidance for the purpose. This measurement framework contributes a number of benefits for FE/HE institutions such as:

- Providing a better understanding of co-location project success and the way by which the performance of such projects is measured;
- Providing governors and policy-driven people with the means to be acquainted with the performance dimensions of a co-located campus and the criteria that determine the long-term success of sharing core and support educational services.
- The framework is sufficiently well developed in a clear, simple and feasible format for the use of educational institutions opting to share their facilities and services with other institutions in one campus. It will help them to take a comprehensive view of key areas that need to be examined in detail when developing their business case.

- Providing process-driven people who will manage the co-location project with a dynamic tool to direct and control project performance, and informing continuous improvement to the project processes.

9.6 Limitations

Developing the performance measurement framework involved particular research design and attention to the process of carrying out the research study phases. The study did, however, have a number of limitations which are expressed as follows:

- In the first phase of the study, exploring success criteria that are specific to a FE/HE co-location project facilitated by a construction project engaged with the opinions of experienced participants who were drawn from one co-location illustrative project because there were no other co-location projects in Scotland. This limitation also applies to the validation of the framework in the third phase, as the panel of co-location experts consulted to validate the developed measurement framework were similarly bound by the limited expertise available. The panel represented the same co-location project case study used in the first phase.
- Establishing the performance measurement framework was carried out in the second phase. This process required the opinions of a wider FE/HE sample to be elicited. A questionnaire survey was used to collect the data. The sample that the questionnaire targeted included people who did not have experience in managing such projects. However, the sample was drawn from those holding positions similar to those who were directly involved in the co-location case study project and who participated in phases one and three of this study. Therefore, the measurement framework was established based on the perceptions of a sample of future users.
- Aggregating a group of performance measures into a single performance index was done on one project case and therefore, the performance of a co-location

construction project would be compared to its objectives set at the start of the project initiation phase.

- The participants of the focus group were divided into two groups so that each group could address one performance perspective with sufficient time to fully evaluate and discuss their dimension of the performance measures drawn from literature. This division and the time frame made each group of participants focus on just one performance perspective and its success dimensions and measures, without opportunity to contribute their opinions about the other performance perspective. Thus the views elicited for each dimension of the framework were compromised in their scope.

9.6 Recommendations

There have been a number of areas identified in this research that could be developed further. These areas are summarised below:

- The findings of this study were intended to provide further and higher education institutions with a structured way of measuring the performance of a co-location project facilitated by a construction project. However, it is recommended that the framework is revisited in few years' time, when the FE/HE co-location experience will have matured and when more such projects have been undertaken, to re-examine the structure and the content of the framework. It is expected that new performance aspects could emerge while others can be eliminated. This could lead to introducing or eliminating performance measures or dimensions in the performance measurement structure especially at the post delivery stage of the co-location.
- The analysis of the questionnaire was carried out combining the opinions of the identified sample in further education institutions, higher education institutions and other forms of educational institutions and funding bodies. It could be of great interest to analyse the data for each category and compare the results to figure out if there is difference in opinion between further and higher education institutions towards what characterises successful FE/HE co-location

project. Potential differences may result in the development of two sets of measurement frameworks; one for each sector. This could assist FE/HE institutions to emphasis areas that are specific to each sector.

- The developed performance measurement framework adopts the structure of two well known measurement frameworks in academia and general business. These frameworks are the Results and Determinants framework of Fitzgerald *et al.* (1991) and the European Foundation for Quality Management (EFQM) Excellence Model. The framework consequentially divided overall performance into two perspectives: performance drivers and performance results. Each of these performance perspectives has a number of performance dimensions. Moreover, each performance dimension, in turn, has a set of performance measures. It is recommended that further study explores the cause and effect relationship between the performance dimensions of the performance drivers, and the performance dimensions of the performance results. This can be expanded to examine the cause and effect relationships between the performance measures of the performance drivers and the performance measures of the performance results. Examining this type of cause and effect association may reveal what effects a performance drivers dimension or measure can have on a performance results dimension or measure respectively.

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Appendix A

A Copy of the Pilot Testing Questionnaire

The purpose of this questionnaire is to help the researcher confirms how the performance of a co-location project will be measured. The results of the questionnaire will be utilised to formulate a performance measurement framework that will be used to calculate and benchmark the performance of future further and higher education co-location projects within Scotland and nationwide.

Section 1 – General information

Name of institution:

Type of institution:

Further education ☐

Higher education ☐

Other: _____

Section 2 – Rating “performance measures” of a co-location project

Please indicate how much you think each performance measure of the following is important to a co-location project success (1= not important, 10= very important):

In your opinion, to what extent do you agree that each of the following performance measures can be used to characterise the success of further and higher education co-location project (1= Strongly disagree, 10= Strongly agree)

- Academic articulation

This measure indicates the process by which the co-located institutions introduce formal and documented arrangements that are necessary so that students can transfer from one course, programme or educational level from one institution to another at other co-located institutions.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Student retention

This measure indicates the capability of the co-located institutions to maintain and retain students at their co-located campus.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Effective communication

Communication is a process by which information is exchanged between the co-located institutions. It indicates how competent the co-located institutions are in developing communication with each other so that they can manage the co-location project activities more effectively.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- **Student achievements**
This measure indicates the students' progression rate within the co-located institutions.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- **Staff and human resource development**
This indicator measures how competent the co-located institutions are in developing and managing shared human resources services.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- **Student recruitment**
This measure indicates the capability of the co-located institutions to attract students to study at their co-located campus.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- **Minimising disruption during delivery stage**
This indicator measures how effective the co-located institutions are in minimising disruption to the ongoing educational activities during times of development work on the co-located campus.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- **Space efficiency**
This measure indicates the ability of the co-located institutions to use their shared spaces effectively by considering the optimum necessary space for the educational and educational support functions, number of student/staff using the space.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- **Life cycle costing**
Life Cycle Costing (LCC) is a method by which the total costs that arise during the project life are considered. It indicates the capability of the co-located institutions to define the whole life costs of obtaining, running and maintaining the co-location campus.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- **Cost effectiveness**
This measure indicates the extent to which the co-located campus (shared estates) provides educational value for money spent on these shared estates.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- **Administration process**
This measure indicates how effective the co-located institutions are in administrating a broad array of academic affairs services and competencies that provide fundamental academic support functions.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- **Space productivity (income)**
This measure indicates how effectively the co-located institutions utilise their shared spaces to support educational activities and generate revenue.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- **Trust building**
This measure indicates how developed the co-located institutions are in building and managing their trust when working collaboratively.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- **Construction service quality**
This measure indicates the level to which the output of the construction project conforms to their specifications.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- **Efficiency of using water**
This measure indicates how efficient the co-location institutions are in managing their energy resources.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- **Meeting the needs for educational services**
This measure indicates to the capability of the co-located institutions to determine the needs and wants of students and education markets.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- **Energy efficiency**
This measure indicates how efficient the co-location institutions are in managing their energy resources.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- **Building quality**
This measure indicates the level to which the output of the construction project is functional and free of defects and provides safe and healthy studying and working conditions to the co-located institutions' students and staff.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Staff involvement and buy in
This measure indicates how competent the co-located institutions are in involving end-users in understanding the benefits of sharing the services and facilities of one campus.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- End users satisfaction with shared space
This measure indicates levels of satisfaction with the integrated use of shared spaces.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Promoting the strengths of the FE/HE co-located institutions
This measure indicates the capability of the co-located institutions to promote the strengths and benefits of sharing educational facilities and services to students and potential applicants within an environment of international competition.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Procurement and delivery service
This measure indicates how competent the co-located institutions are in managing the construction procurement functions.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Student satisfaction with the shared education
This measure indicates levels of satisfaction with the shared teaching and learning activities and articulated programmes.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Quality of the academic staff
This measure indicates how competent the co-located institutions are in enhancing the skills of the academic staff and academic support staff to meet the requirements of the shared educational provision.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Satisfaction during delivery stage
This measure indicates levels of satisfaction of the co-located institutions with the construction service provided by the co-location project contractor and sub-contractors.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- End users satisfaction with the shared facilities
This measure indicates levels of satisfaction with the integrated use of shared facilities and services.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Construction time
This measure indicates the time prediction of construction/refurbishment work.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Construction cost
This measure indicates the cost prediction performance of the construction/refurbishment work.

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section 3 – Further comments and recommendations

Please use this space to expand on any of the questions.

Section 4 – Contact details

If you would like to know about the final results of the questionnaire, please note your contact details below.

Thank you very much for your time!

Appendix B

A Copy of the Questionnaire Survey

The purpose of this questionnaire is to help the researcher confirms how the performance of a co-location project will be measured. The results of the questionnaire will be utilised to formulate a performance measurement framework that will be used to calculate and benchmark the performance of future further and higher education co-location projects within Scotland and nationwide.

Section 1 – General information

Name of institution:

Type of institution:

Further education ☐

Higher education ☐

Other: _____

Section 2 – Rating “performance measures” of a co-location project

Please indicate how much you think each performance measure of the following is important to a co-location project success (1= not important, 10= very important):

In your opinion, to what extent do you agree that each of the following performance measures can be used to characterise the success of further and higher education co-location project (1= Strongly disagree, 10= Strongly agree)

- Academic articulation;

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Student retention

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Effective communication

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Student achievements

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Staff and human resource development

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Student recruitment

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Minimising disruption during delivery stage

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Space efficiency

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Life cycle costing

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Cost effectiveness

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Administration process

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Space productivity (income)

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Trust building

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Construction service quality

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Efficiency of using water

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Meeting the needs for educational services

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Energy efficiency

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Building quality

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Staff involvement and buy in

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- End users satisfaction with shared space

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Promoting the strengths of the FE/HE co-located institutions

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Procurement and delivery service

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Academic articulation

1	2	3	4	5	6	7	8	9	10	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Student satisfaction with the shared education

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Quality of the academic staff

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Satisfaction during delivery stage

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- End users satisfaction with the shared facilities

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Construction time

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Construction cost

1	2	3	4	5	6	7	8	9	10	don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section 3 – Further comments and recommendations

Please use this space to expand on any of the questions.

Section 4 – Contact details

If you would like to know about the final results of the questionnaire, please note your contact details below.

Thank you very much for your time!

Appendix C

Example of a Qualitative Performance Measure (Effective Communication)

Indicator title	<i>Effective Communication</i>
Type	Performance drivers measure
Definition	Communication is a process by which information is exchanged between the co-located institutions. This measure indicates how competent the co-located institutions are in developing communication with each other so that they can manage the co-location project activities more effectively.
Purpose of measurement	<ul style="list-style-type: none"> • To increase project management effectiveness • To promote and develop partnership between the co-located institutions • To increase interaction among student and staff of the collocated institutions through enhanced interpersonal, group and organisational communication
Weight	29%
Relates to	Sharing educational knowledge
Method	<ul style="list-style-type: none"> • Identify the targeted maturity level • Identify the current maturity level based on the maturity matrix provided • “Communication” performance indicator = $\frac{\text{Current level} - \text{Target level}}{\text{Targeted level}} \times 100$ • The result feeds into “Sharing educational knowledge” performance measurement.
Frequency	Quarterly, every six months
Who measures?	Co-location project manager, IT managers
Source of data	Institution’s observation, surveys, audits
Who acts on the data?	Co-location project manager, Directors of planning, Directors of teaching and learning
Notes and comments	Focus group workshop might be needed to decide the overall capability maturity level.

Maturity matrix:

Level 1	Level 2	Level 3	Level 4	Level 5
<p>Informal, more self-organised communication structures are used.</p> <p>Communication channels (face-to-face, written, verbal, nonverbal, visual, or electronic communication) emerge through individual relationships or contacts between individuals who are willing to co-operate are established</p> <p>Communication tends to be natural with spontaneous interaction.</p> <p>The proposed goals of educational knowledge exchange are established.</p> <p>The shared ICT infrastructure is installed and developed as reactive activities according to demanding situations.</p> <p>Technical support for the design and planning, deployment, and operation activities of the shared ICT lacks suitable skills, knowledge and resources.</p>	<p>Information is transferred through informal communication among students and staff.</p> <p>Communication systems, channels, are structured.</p> <p>The level of interaction is subject to group norms with limited feedback and with spontaneous interaction.</p> <p>General guidelines for the development and installation of shared ICT infrastructure are developed.</p> <p>Technical support provides basic skills, knowledge and resources necessary for the shared ICT.</p>	<p>Information is transferred through formal and informal communication between staff and students.</p> <p>Information exchange is recorded for future reference.</p> <p>Information is controlled through well-established channels and systems so that individuals do not experience information overload and they receive information they need.</p> <p>Appropriate plans and strategies for the development and installation of the shared ICT infrastructure are standardised and documented for future use.</p> <p>The competencies required to support the design and planning, deployment, and operation activities of the shared ICT are defined.</p>	<p>Interpersonal communication is observed and recorded to identify effective communication.</p> <p>The direction of the communication movement is clear and in relation to the project organisation hierarchy system; identified communication obstacles are analysed.</p> <p>Specified rules and procedures are followed when communicating.</p> <p>Educational knowledge exchange is captured, evaluated, assimilated and used in developing and updating existing knowledge.</p> <p>Appropriate plans and strategies for the development and installation of the shared ICT infrastructure are continuously reviewed to meet the learning needs.</p> <p>Necessary competencies are reviewed and evaluated to support the shared ICT.</p>	<p>A profile of effective interpersonal communication between and among student/staff is built up.</p> <p>The profile is used as a reference to update training of student/staff and newcomers.</p> <p>The form and content of the communication reflect the co-located institutions' values, beliefs, assumptions and perceptions.</p> <p>New educational knowledge is developed and adopted in order to acquire competitive advantage through academic quality enhancement and innovation of the co-locating institutions.</p> <p>Plans and strategies for the development and installation of the shared ICT infrastructure are constantly modified to assure education needs are met.</p> <p>Changes made to ICT operations have minimum impact possible on the educational processes.</p> <p>Required competencies are updated and improved.</p>

Appendix D

Example of a Quantitative Performance Measure

Outcome title	<i>Space Efficiency</i>
Type	Performance results measure
Definition	This measure indicates the ability of the co-located institutions to use their shared spaces effectively by considering the optimum necessary space for the educational and educational support functions, number of student/staff using the space.
Purpose of measurement	<ul style="list-style-type: none"> To improve space management and planning To encourage cost-effective use of space
Weight	20%
Relates to	Learning built environment
Method	<ul style="list-style-type: none"> Identify target and current values of the following variables: <ul style="list-style-type: none"> Total NIA, total GIA, teaching NIA, research NIA, total office NIA, learning centre NIA, total student FTE, taught student FTE, research student FTE, total staff FTE, research staff FTE, academic staff FTE; Calculate target and current performance of: <ul style="list-style-type: none"> Total NIA per total population (student FTE & staff FTE) Teaching NIA per taught student FTE Research NIA per research student FTE & research staff FTE Total office NIA per staff FTE Learning centre NIA per total student FTE and academic staff FTE Ratio of NIA to GIA For each calculation, divide (current performance – target performance) by target performance Take the average of the results The performance outcome of “Space efficiency” is equal to the result calculated above multiplied by 100 This performance feeds into “Learning built environment” performance measurement.
Frequency	Upon project completion, annually thereafter
Who measures?	Head of Campus Services
Source of data	Institution’s audits, EMS, e-mandate
Who acts on the data?	Director of Estates, Timetabler, Co-location project manager
Notes and comments	<ul style="list-style-type: none"> Differences in teaching NIA need to be recognised when calculating the measures (i.e. teaching areas for design studios and class rooms are different and therefore greater space per student for the first than that for the second) could be noticed.

Appendix E

The Validating Questionnaire

The purpose of this session is to explore the opinions of the experts in the field of managing FE/HE co-location projects regarding a framework developed to measure the performance of these types of projects; and to investigate their views about the content of the framework to confirm how the performance of a FE/HE co-location project will be measured. The results of the questionnaire will inform the overall performance measurement structure, its hierarchy of measures, and the method used to determine and benchmark the performance of a co-location project against predetermined targets and/or against the performance of other future co-location projects.

Section 1 – General information

Type of organisation:

Further education ☐

Higher education ☐

Other: _____

Section 2 – The overall performance measurement framework

Using a scale from 1 to 10 (where 1= strongly disagree, 10= strongly agree), to what extent do you think that overall performance measurement framework is:

- Comprehensive – The framework covers a range of performance criteria that represent different stakeholders;

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Balanced – the framework includes a variety of criteria that measure quantitatively and qualitatively how far the co-locating institutions are in achieving the agreed definition of a successful project;

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Adaptable –The framework can be used for different co-location projects;

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section 3 – The performance measures

Using a scale from 1 to 10 (where 1= strongly disagree, 10= strongly agree), to what extent do you think that overall performance measures are:

- Strategy driven (Relevant) – The measures reflect the strategy of the FE/HE co-location institutions relating to the co-location project;

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Understandable – The measures are clearly defined and they are easy to understand;

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Effective – the – the measures are benefit and not just another task imposed on an already busy schedule;

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Useful (Relevant) – The measures provide useful information;

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Focused on improvement – The framework promotes the right actions to achieve project and organisational objectives;

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section 4 – The performance measurement process

Using a scale from 1 to 10 (where 1= strongly disagree, 10= strongly agree), to what extent do you think that measurement process is:

- Simple – The process does not need a lot of effort to complete.

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Clear – The process is based on an explicitly defined method of measurement and sources of data

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Feasible –Gathering data is part of an ongoing process whenever possible;

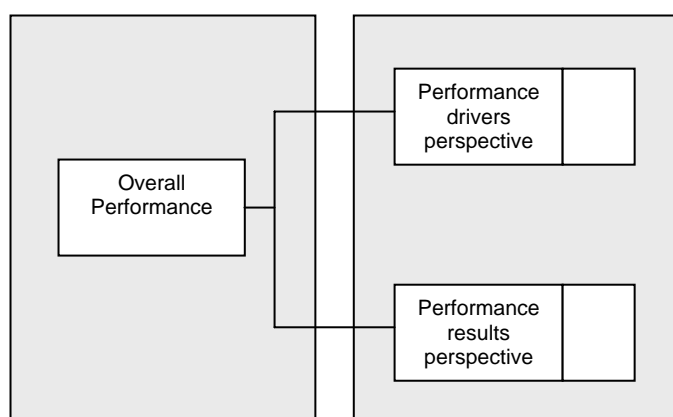
1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Applicable – The process can be implemented;

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

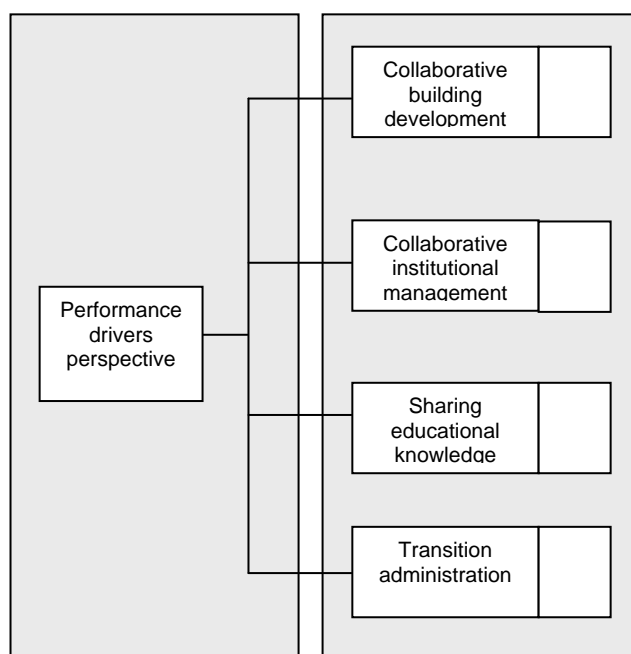
Section 5 – Weightings of performance perspectives

- If you had 100 points, how would you split them between the leading and lagging performance dimensions?

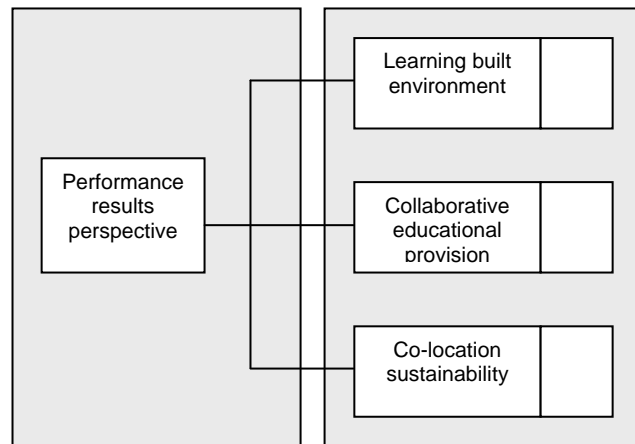


Section 6 – Weightings of performance dimension

- If you had 100 points, how would you allocate them to the performance drivers dimensions?



- If you had 100 points, how would you allocate them to the performance results dimensions?



Thank you very much for your time!

Appendix F

The Performance Measurement Framework for Co-Located Educational Institutions

Performance measurement framework for co-located educational institutions

Definitions, methods and measures

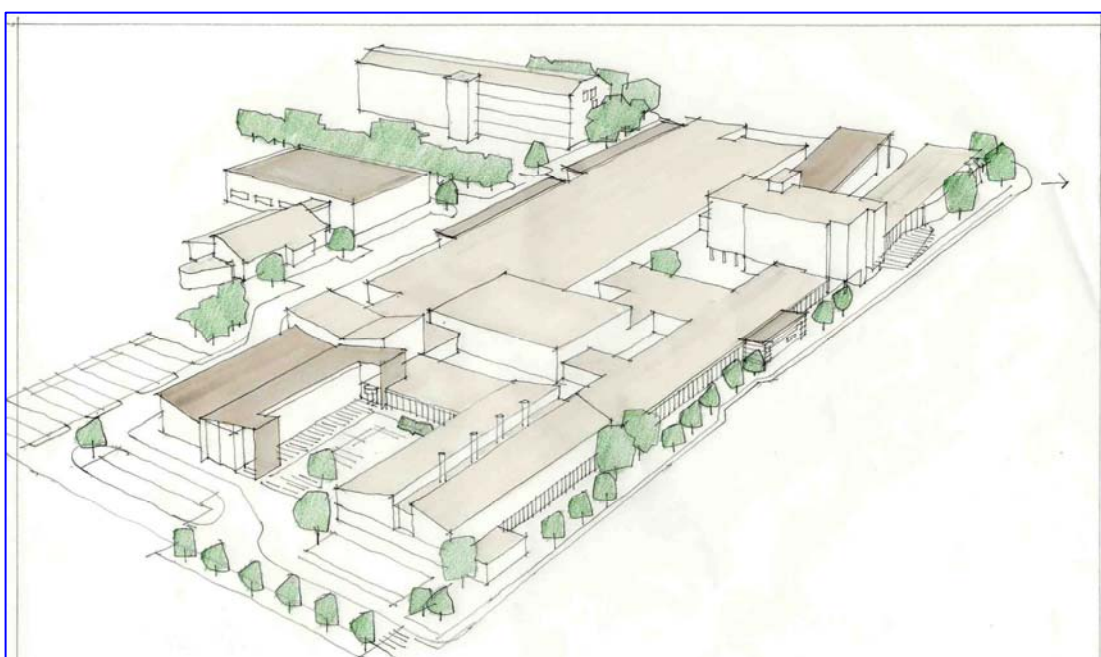


Table of Contents

INTRODUCTION.....	278
FRAMEWORK USERS	278
The measurement framework.....	279
Framework characteristics.....	280
Framework perspectives.....	280
Performance drivers	280
Performance results	281
Three levels of measurement	281
Overall performance.....	281
Performance dimensions	281
Performance indicators and performance outcomes	282
PERFORMANCE MEASURING	283
OVERALL PERFORMANCE	288
Overall Performance Index	289
Performance Drivers Index	290
Performance Results Index	291
DIMENSIONS OF PERFORMANCE DRIVERS.....	292
Sharing Educational Knowledge.....	293
Collaborative Institutional Management.....	294
Transition Administration	295
Collaborative Building Development	296
DIMENSIONS OF PERFORMANCE RESULTS.....	297
Learning Built Environment	298
Collaborative Educational Provision	299
Co-location Sustainability	300
PERFORMANCE DRIVERS	301
Procurement and delivery service	302
Construction/Refurbishment Time.....	304
Construction/Refurbishment Cost.....	305
Trust Building	312
Staff and human resource development	314
Teaching Skills of the Academic Staff.....	316
Academic Articulation	319
Effective Communication	321
Minimising disruption during delivery stage	328
Staff involvement and buy in	329
Satisfaction during Delivery Service	331

PERFORMANCE RESULTS	332
Space Efficiency	333
Space Productivity	334
Cost Effectiveness.....	335
Building Quality	336
Staff/student Satisfaction (Shared space).....	337
Staff/student Satisfaction (Shared facilities and services)	338
Student Recruitment.....	340
Student Retention	341
Staff Retention	342
Student Achievement	343
Student Satisfaction (Shared education)	344
Social Impact on Community	346
Economic Impact on Community	347
Environmental Impact on Community.....	349

Introduction

Delivering high quality educational service through co-locating two or more institutions at the same campus is an innovative approach to providing efficient services and facilities, and offering a better learning environment for students and academic staff. This approach is directly related to the “Efficient Government Initiative”, launched by the Scottish Executive and aimed at delivering high quality, user-focused and innovative public services in Scotland.

Co-location, while providing an effective, efficient and strategic solution for enhancing the educational infrastructure in a particular location, also brings to the co-located institutions significant financial, functional and structural advantages that could be difficult to achieve otherwise. It is for this reason that developing a framework to measure how well the shared campus is doing not only will introduce effective techniques for measuring its performance, but will also assist in managing and adapting to the sharing services and facilities. In addition, this approach will enhance the ability of the educational institutions to counter escalating running costs and, at the same time, meet the growing demands of students for better quality and value for money.

Framework users

The performance measurement framework has been developed for three main potential users.

First, it provides governors and policy-driven people with the means to be acquainted
Delivering high quality educational service through co-locating two or more institutions at the same campus is an innovative approach to providing efficient services and facilities, and offering a better learning environment for students and academic staff. This approach is directly related to the “Efficient Government Initiative”, launched by the Scottish Executive and aimed at delivering high quality, user-focused and innovative public services in Scotland.

Co-location, while providing an effective, efficient and strategic solution for enhancing the educational infrastructure in a particular location, also brings to the co-located with

the performance dimensions of a co-located campus and criteria that determine the long-term success of sharing core and support educational services at one particular site.

Second, the framework is sufficiently well developed in a clear, simple and feasible format for the use of educational institutions opting to share their facilities and services with other institutions in one campus. They will have the opportunity to have a comprehensive view of key areas that need to be examined in detail when developing their business case.

Third, it provides process-driven people who will manage the co-location project with a dynamic tool necessary to direct and control the project performance, and offers continuous improvement to the project processes.

The measurement framework

The performance measurement framework is a comprehensive toolkit that has been developed by Heriot-Watt University as part of a research project funded by the Scottish Funding Council (SFC). The framework has been validated through consulting the opinions and views of academic and professional people working in the education sector who have the expertise in dealing and managing co-location projects. They found this framework to be a useful and significant improvement tool.

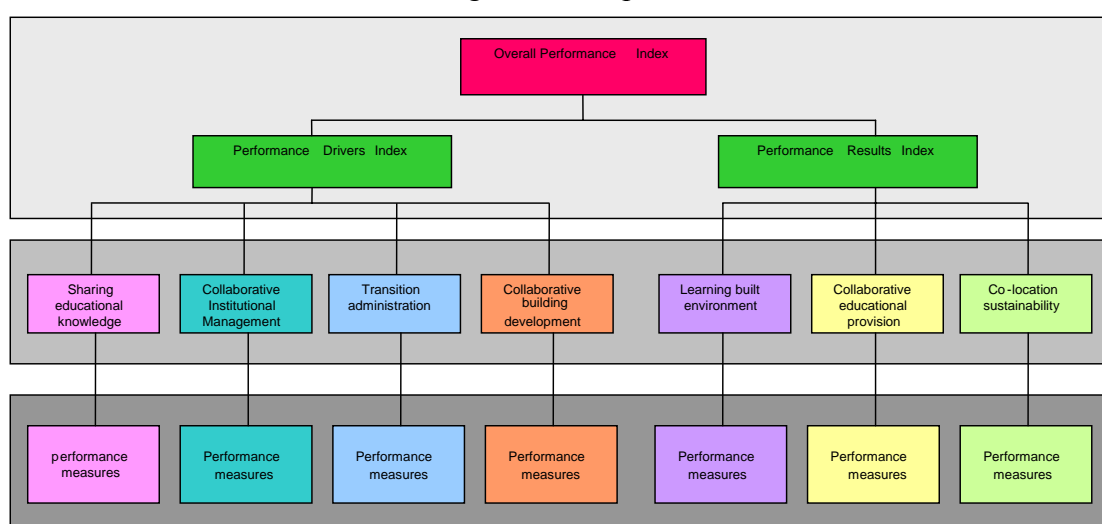


Figure 1: Performance measurement framework

Framework characteristics

The measurement framework has two distinctive parts: performance drivers and performance results, assuming that the project consists of two stages, namely project delivery and post delivery. In addition, the framework has three hierarchical levels: overall performance, performance dimensions and performance measures. While the top two levels are for the use of senior management, the third level has been structured for the use of managing the co-location collaborative project activities.

Framework perspectives

The framework includes two performance measurement perspectives based on the delivery and post delivery project stages;

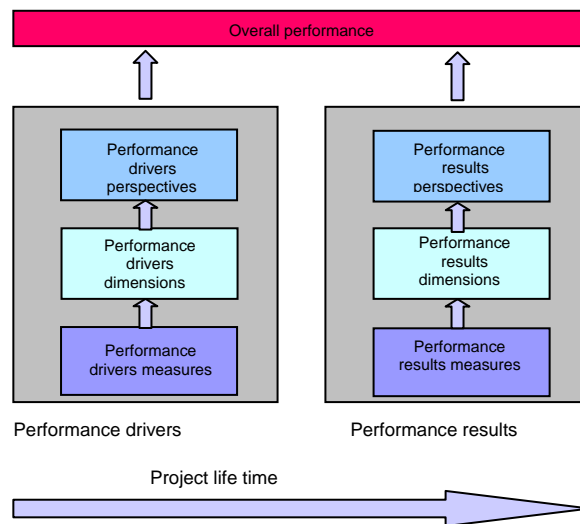


Figure 2: Framework perspectives (performance drivers and results)

Performance drivers

This part of the measurement framework covers one stage of the co-location project which is the project delivery stage. This stage includes project phases from inception through to the point when the constructed campus is handed over to co-located institutions. The performance in this part is assessed using performance drivers measures, as the focus tends to be on measuring critical aspects of the developing project that are supposed to improve the future performance of the co-location project at the post-delivery stage when the shared campus is operational.

Performance results

The other part of the framework covers the project post-delivery stage. This stage starts when the shared campus is put into operation, and expands till the end of the proposed age of the co-location project. The performance in this part is measured by assessing the intended outcomes of the co-location project using performance results. Some of the results may need some time before they are realised and consequently measured. Therefore, the overall performance of the co-location project is expected to improve through time.

Three levels of measurement

The framework comprises three hierarchal levels of performance that provide hierarchal performance summaries to different users (governors, education institutions management or co-location project managers).

Overall performance

This top hierarchical level includes the “Overall Performance” index, the “Performance Drivers” index and the “Performance Results” index.

Performance indices at the level of the hierarchy provide governors and senior management of involved institutions with an extensive or generic view of performance drivers and outcomes based on multidimensional leading performance indicators and lagging project performance indicators. They also offer a summarised performance based on aggregated measures so that the co-location project can be benchmarked against its pre-determined targets.

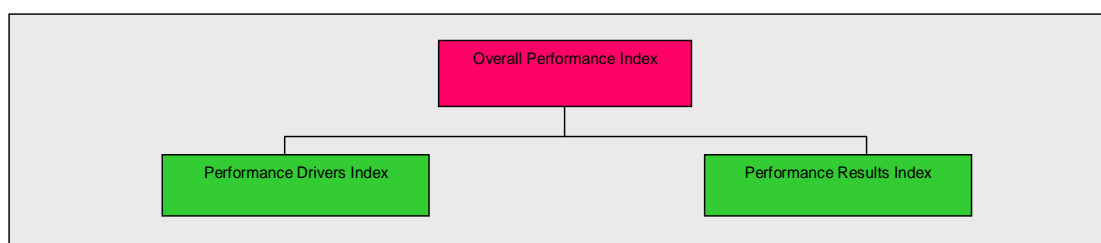


Figure 3: Top level performance summary (overall performance indices)

Performance dimensions

The level includes seven performance dimensions: four dimensions of performance drivers perspective and three dimensions of performance results perspective. Each

dimension is summarised by an aggregated single measure providing governors and senior management of the co-located institutions with useful information about both different aspects of performance. Performance dimension indices also offer the opportunity for the project to be benchmarked against pre-determined targets throughout different stages of the project life-cycle, and against other co-location projects.

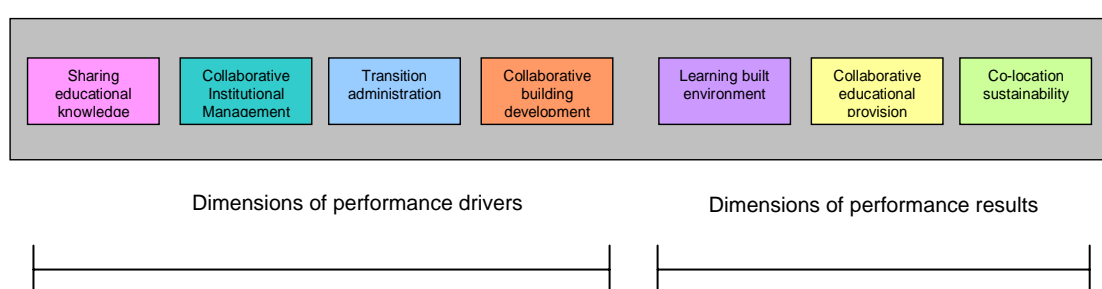
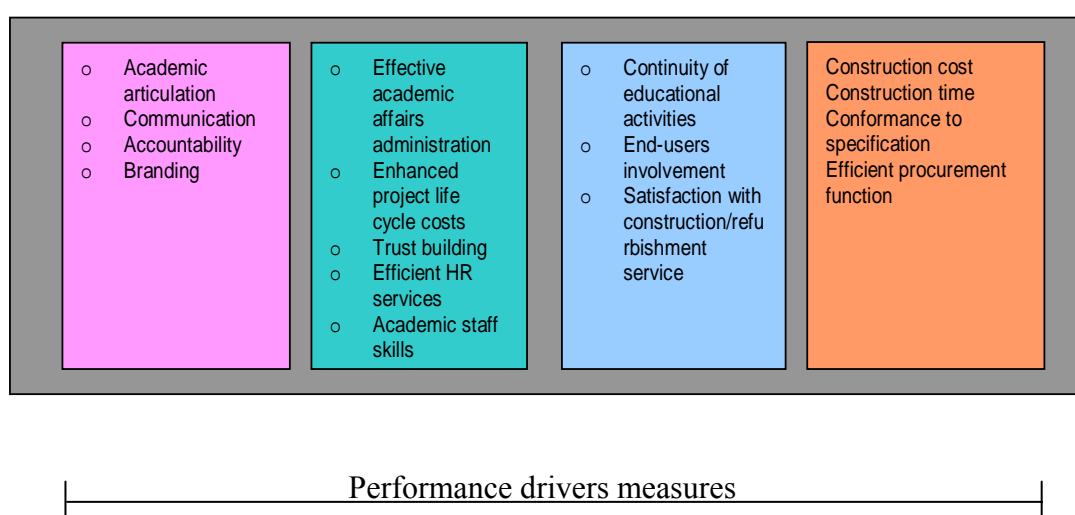


Figure 4: Second level performance summaries (performance dimensions)

Performance indicators and performance outcomes

This level encompasses both, performance drivers measures, and performance results measures. At this level, the project manager and project team of the co-location project have the opportunity to better direct and control the project through detailed sets of measures that provide feedback about how the project is progressing towards achieving its objectives.



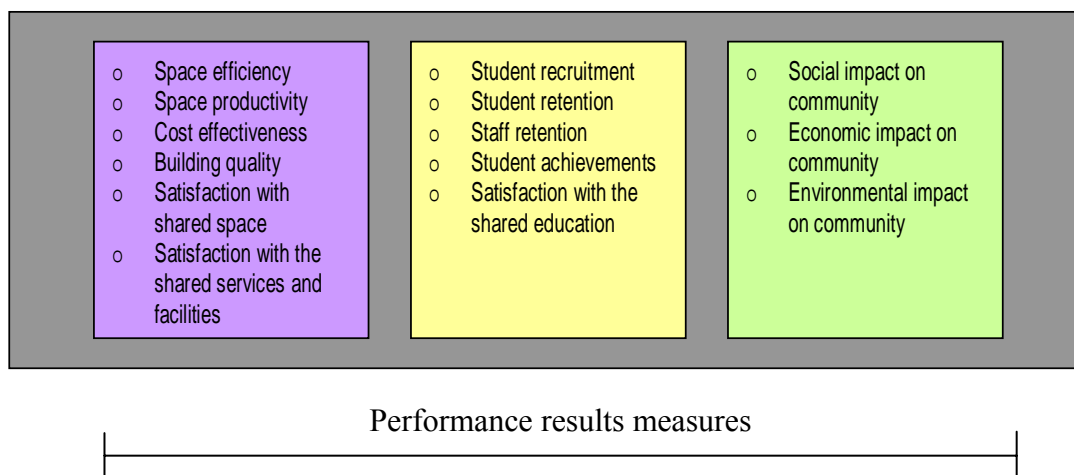


Figure 5: Third level performance drivers and results measures

Performance measuring

The measurement methods presented in this guidance are both process-based qualitative measures and result-focused quantitative measures. In the process-based qualitative measures approach, the co-located institutions will be able to measure their performance by determining their capability level on a five-level scale maturity matrix. This method imposes a continuous improvement approach as people who are managing these processes, in addition to the co-location project manager, measure process performance against a checklist of key performance attributes progressing from level 1 towards proposed good practice at level 5. Data needed for the measurement can be obtained from sources such as co-located institution's academic plans, co-location project documentation, learning and teaching board, the institution's observation, surveys, audits.

The result-focused performance measurement is assessed using calculations that provide direct performance measures. The data for this quantitative approach are obtained from sources such as the higher education estates management statistics (EMS), further education e-Mandate, Higher Education Statistics Agency (HESA), National Student Survey and students' registry records.

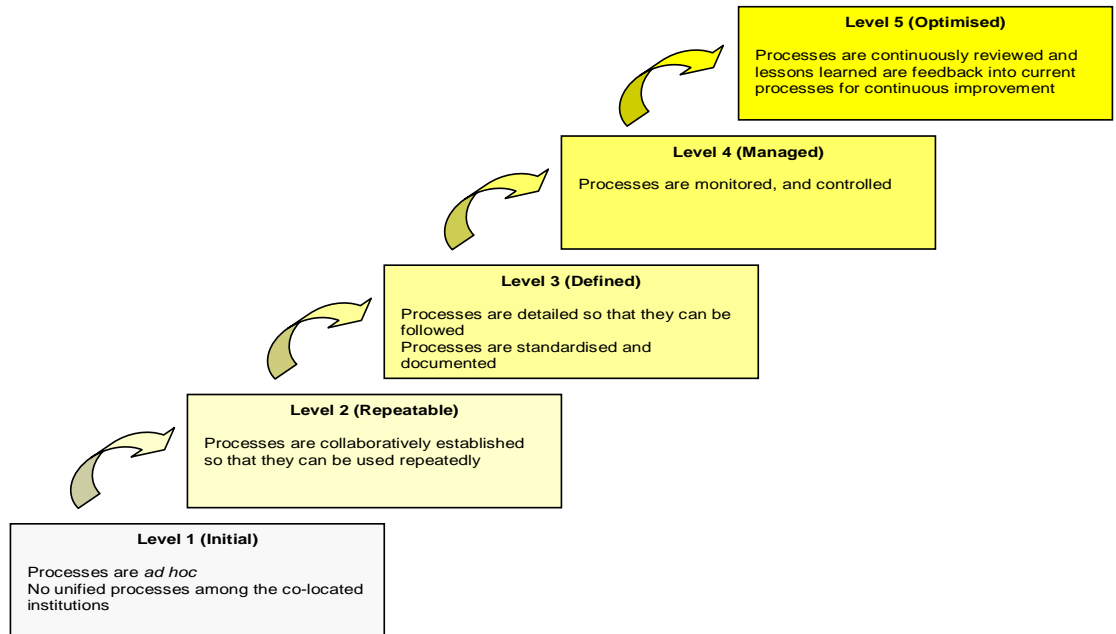


Figure 6: Maturity levels

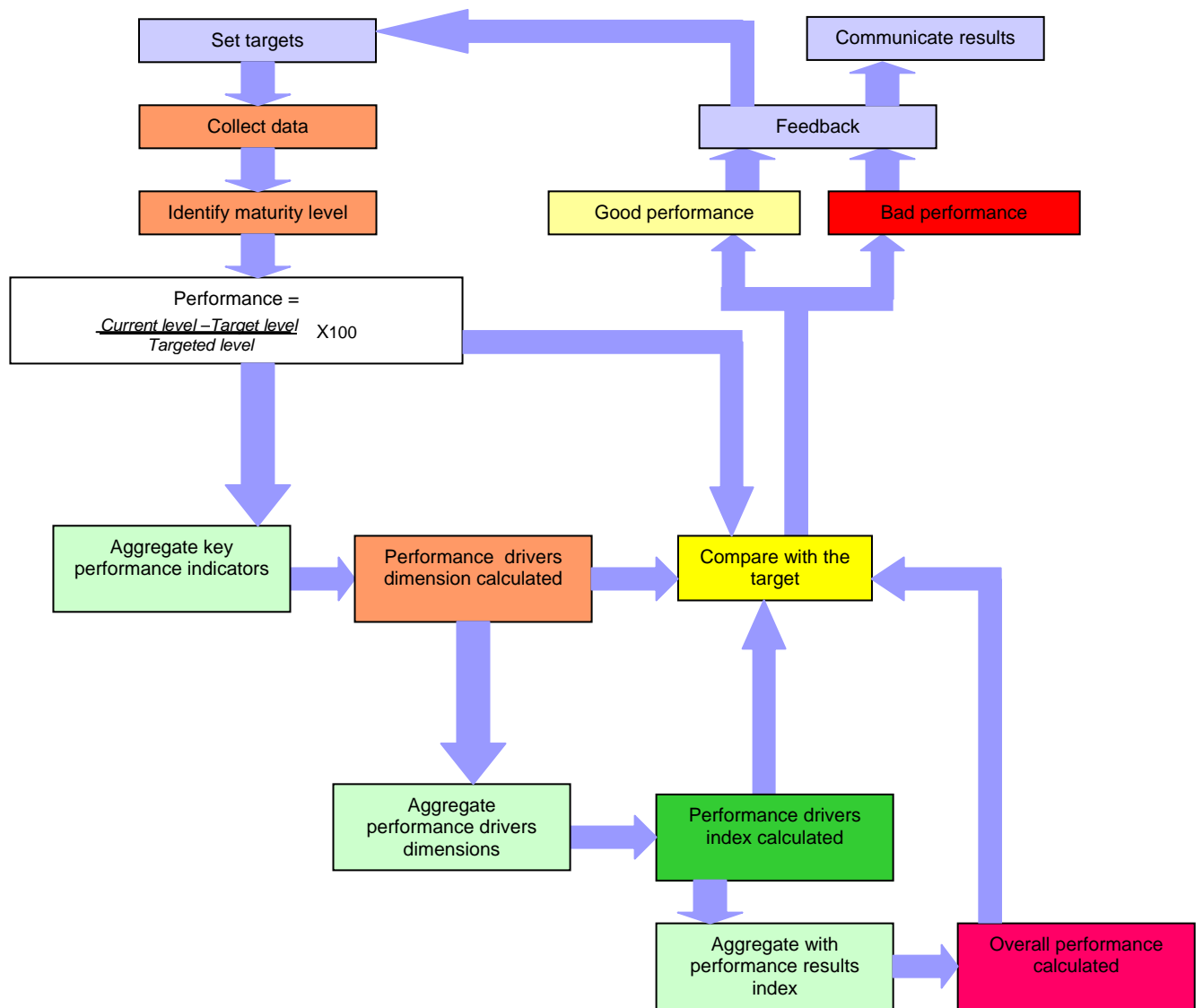


Figure 7: Measurement method of “performance drivers”

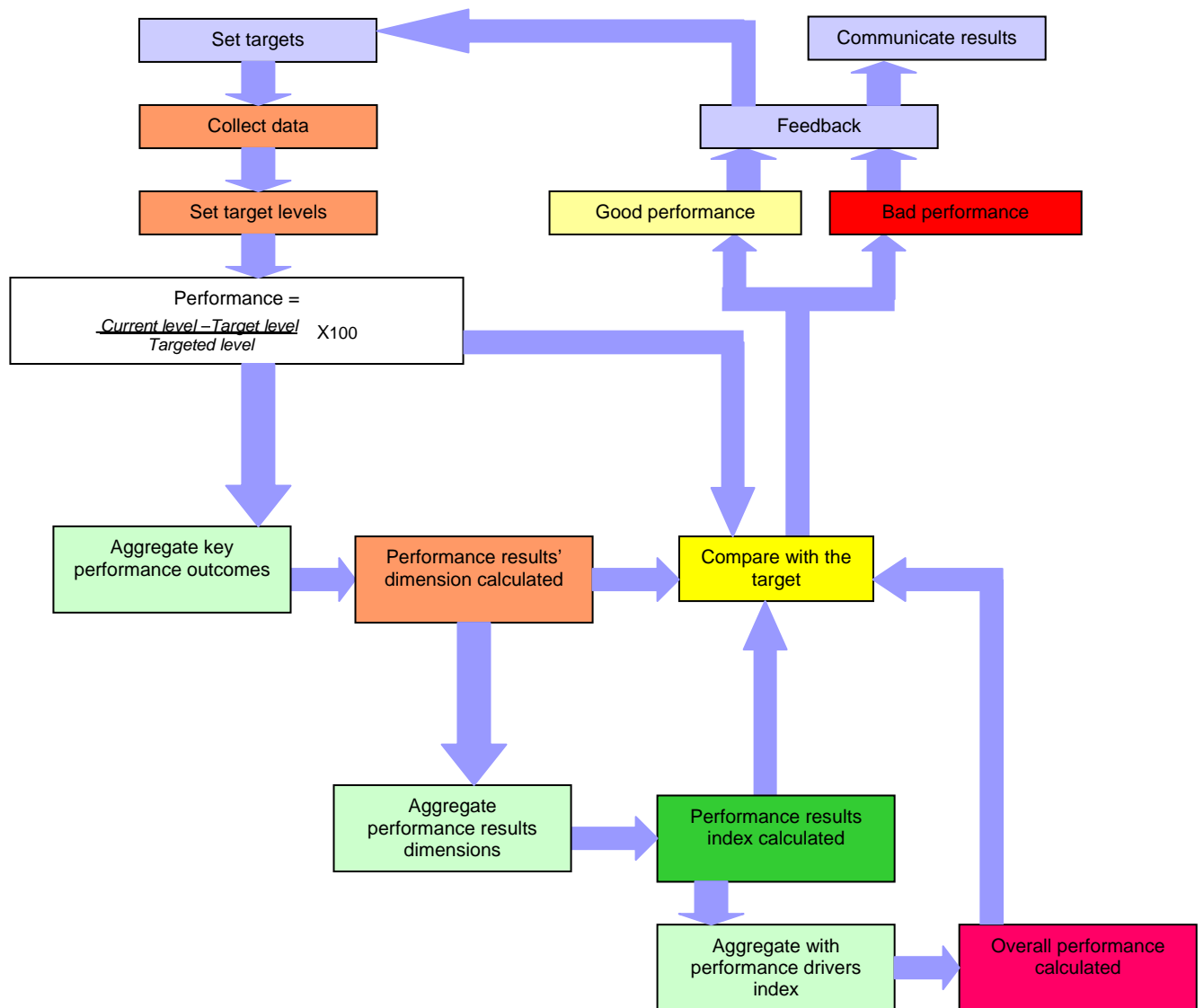
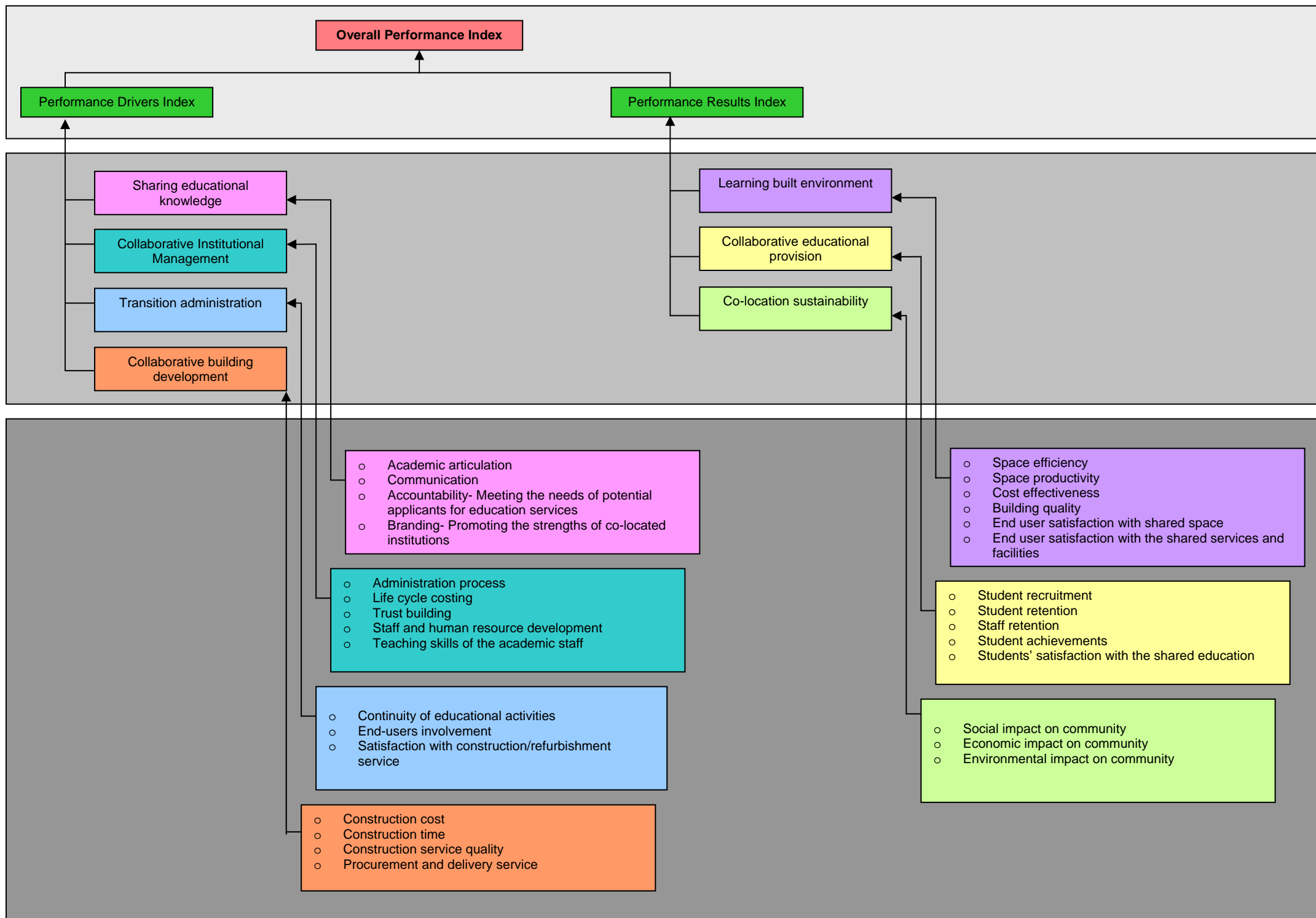
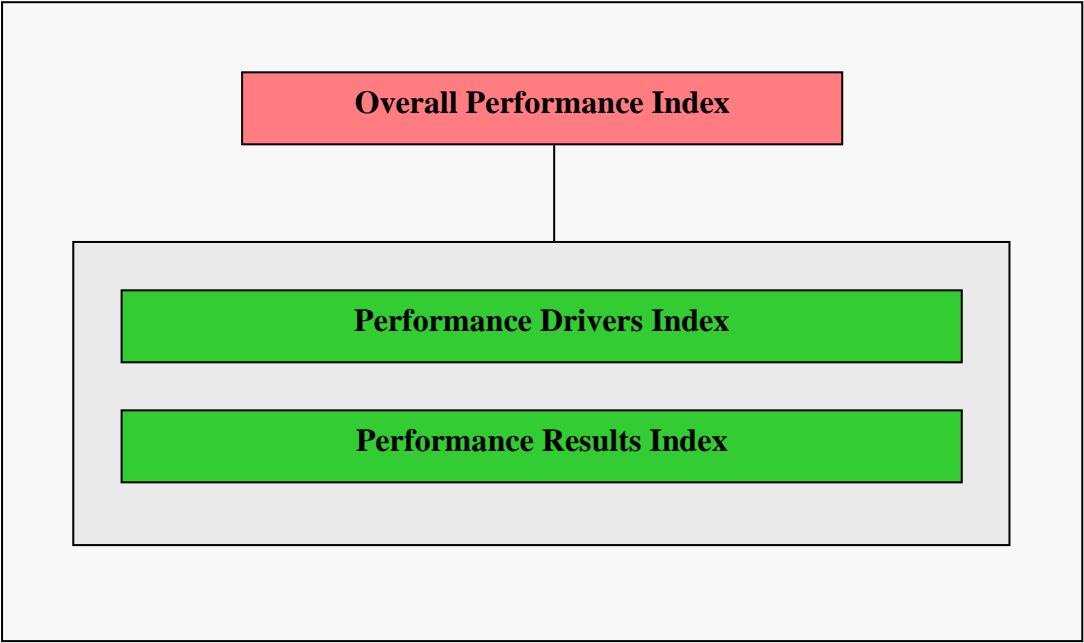


Figure 8: Measurement method of "performance results"



Overall Performance

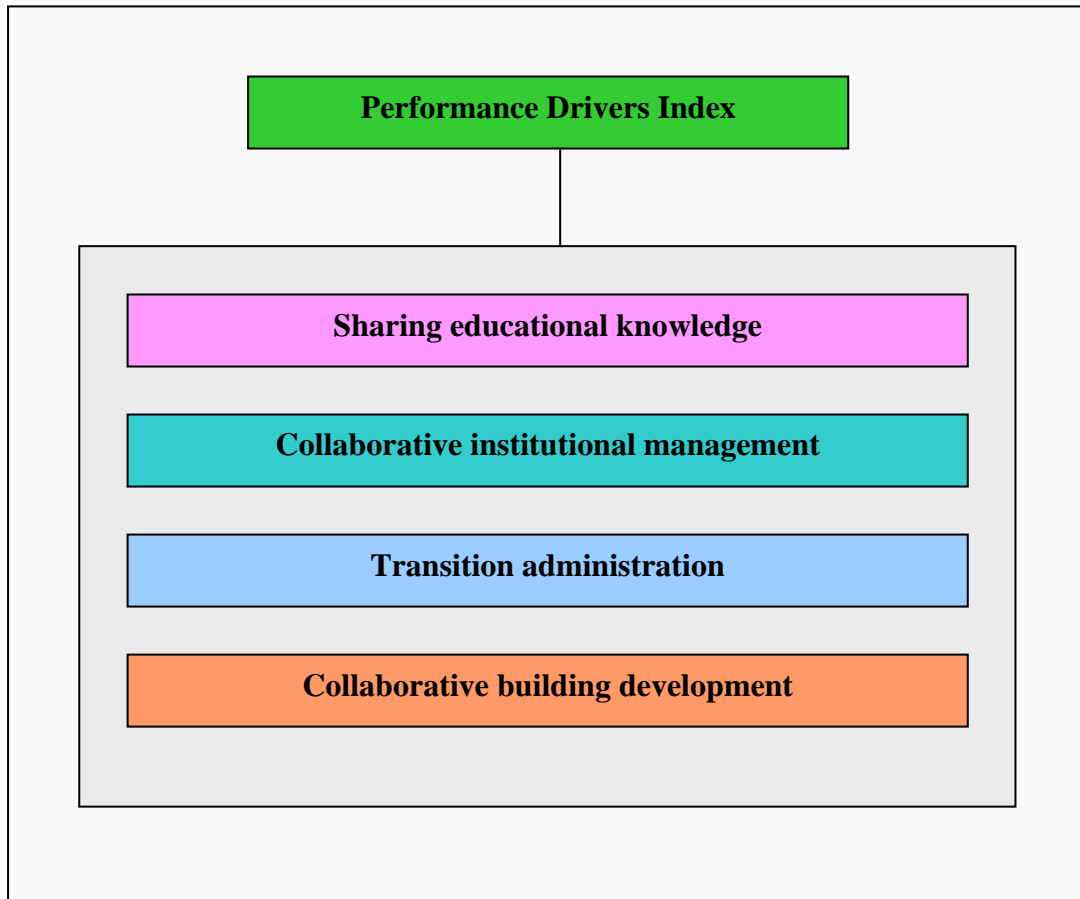


Index title	<i>Overall Performance Index</i>
Definition	An aggregation of the performance drivers index and the performance results index
Purpose of measurement	<ul style="list-style-type: none"> • To provide senior management of the co-located institutions with an extensive or generic view of performance drivers and performance outcomes based on multidimensional leading performance indicators and lagging project performance outcomes • To offer a single measure of performance so that the project can benchmarked against pre-determined targets.
Method	<ul style="list-style-type: none"> • Overall Performance Index = (Performance drivers index X related weight)+ (Performance results index X related weight)
Frequency	Every six months
Who measures?	Project manager
Source of data	Performance dimensions of: <ul style="list-style-type: none"> • Performance drivers index • Performance results index
Who acts on the data?	Senior co-located institutions management
Notes and comments	The performance drivers and performance results indexes need to be calculated before measuring the overall performance index.

Index title	<i>Performance Drivers Index</i>
Definition	An aggregation of the performance drivers dimensions
Purpose of measurement	<ul style="list-style-type: none"> • To provide senior management of the co-located institutions with an extensive or generic view of performance drivers based on multidimensional leading project performance indicators • To offer a single measure of performance so that the project can benchmarked against pre-determined targets.
Weight	50%
Relates to	Overall Performance Index
Method	<ul style="list-style-type: none"> • Performance Drivers Index = performance dimensions of (Sharing educational knowledge X related weight) + (Collaborative institutional management X related weight) + (Transition administration + (Collaborative building development X related weight) • This dimension performance feeds into the “Overall Performance Index”
Frequency	Every six months
Who measures?	Project manager
Source of data	<p>Performance dimensions of:</p> <ul style="list-style-type: none"> • Sharing educational knowledge • Collaborative institutional management • Transition administration • Collaborative building development.
Who acts on the data?	Senior co-located institutions management
Notes and comments	The performance drivers’ dimensions relating to this performance drivers index need to be calculated before measuring this index.

Index title	<i>Performance Results Index</i>
Definition	An aggregation of the performance results dimensions
Purpose of measurement	<ul style="list-style-type: none"> • To provide senior management of the co-located institutions with an extensive or generic view of performance outcomes based on a multidimensional lagging project performance outcomes • To offer a single measure of performance so that the project can benchmarked against pre-determined targets.
Weight	50%
Relates to	Overall Performance Index
Method	<ul style="list-style-type: none"> • Performance Results Index = performance dimensions of (Learning built environment X related weight) + (Collaborative educational provision X related weight) + Shared campus sustainability X related weight) • This dimension performance feeds into the “Overall Performance Index”.
Frequency	Every six months
Who measures?	Project manager
Source of data	<p>Performance dimensions of:</p> <ul style="list-style-type: none"> • Learning built environment • Collaborative educational provision • Shared campus sustainability
Who acts on the data	Senior co-located institutions management
Notes and comments	The performance results’ dimensions relating to this performance results index need to be calculated before measuring this index.

Dimensions of Performance Drivers



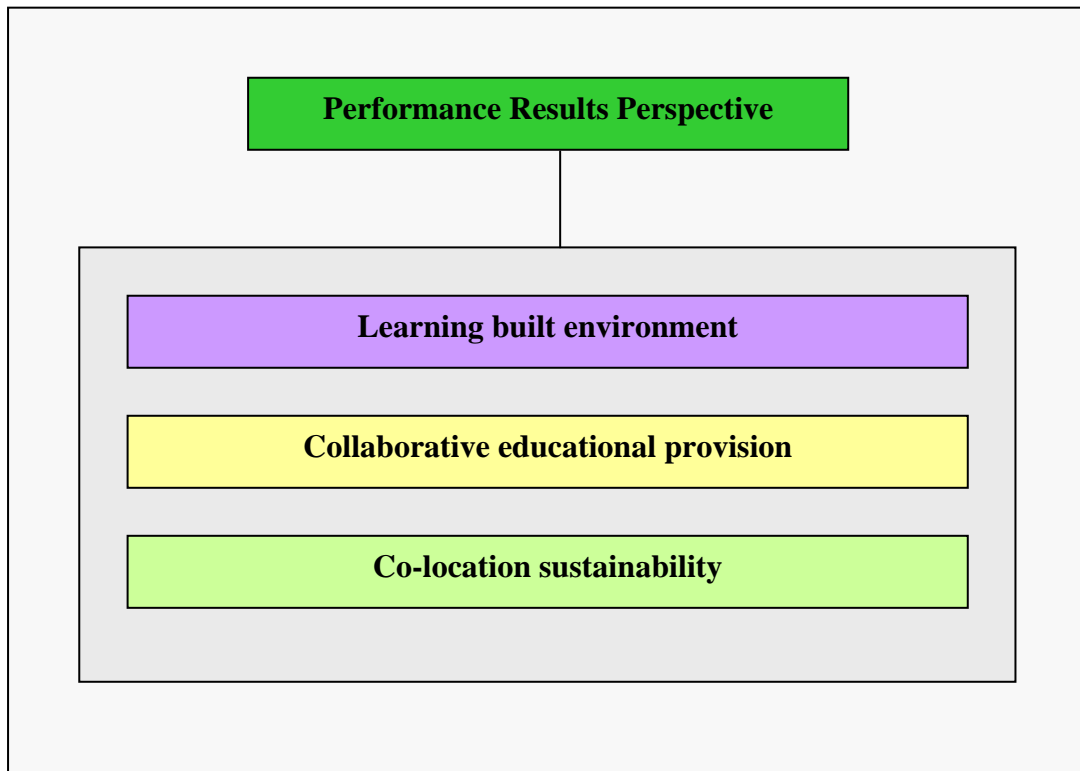
Dimension title	<i>Sharing Educational Knowledge</i>
Type	Performance drivers dimension
Definition	This dimension measures how the co-located institutions work collaboratively to create, exchange and apply new and developed knowledge and good practices.
Purpose of measurement	<ul style="list-style-type: none"> • To initiate innovation • To improve organisational dynamics • To support creating new culture for the co-location campus
Weight	25%
Relates to	Performance Drivers Index
Method	<ul style="list-style-type: none"> • “Sharing educational knowledge” performance = the performance of (Academic articulation X related weight) + (Communication X related weight) + (Accountability X related weight) + (Branding X related weight) • This dimension performance feeds into the “Performance Drivers Index”.
Frequency	Every six months
Who measures?	Co-Location Project Manager
Source of data	Performance indicators of: <ul style="list-style-type: none"> ○ Academic articulation ○ Communication ○ Accountability ○ Branding
Who acts on the data?	Senior co-located institutions management, Co-Location Project Manager
Notes and comments	The Key performance indicators relating to this performance dimension need to be calculated before measuring this dimension.

Dimension title	<i>Collaborative Institutional Management</i>
Type	Performance drivers dimension
Definition	This dimension measures the involvement of the co-located institutions in managing shared campus resources.
Purpose of measurement	To enhance efficiency and effectiveness of joint teams, through increased reliability commitment and trustworthy behaviour among co-located institutions.
Weight	28%
Relates to	Performance Drivers Index
Method	<ul style="list-style-type: none"> • “Collaborative Institutional Management” performance = the performance of (Effective academic affairs administration X related weight) + (Enhanced project life cycle costs X related weight) + (Trust building X related weight) + (Efficient human resource services X related weight) + (Academic and academic support staff skills X related weight) • This dimension performance feeds into the “Performance Drivers Index”.
Frequency	Every six months
Who measures?	Co-Location Project Manager
Source of data	Performance indicators of: <ul style="list-style-type: none"> ○ Effective academic affairs administration ○ Enhanced project life cycle costs ○ Trust building ○ Efficient human resource services ○ Academic and academic support staff skills
Who acts on the data?	Senior co-located institutions management, Co-Location Project Manager
Notes and comments	The key performance indicators relating to this performance dimension need to be calculated before measuring this dimension.

Dimension title	<i>Transition Administration</i>
Type	Performance drivers dimension
Definition	This dimension measures how effective the co-located institutions are in managing the change driven by the institutions co-locating their educational activities, facilities and services during the time of project delivery stage
Purpose of measurement	<ul style="list-style-type: none"> • To enhance change management strategies • To maintain continuity of education activities during the transition period
Weight	16%
Relates to	Performance Drivers Index
Method	<ul style="list-style-type: none"> • “Collaborative institutional management” performance = the performance of (Continuity of educational activities X related weight) + (End-users’ involvement X related weight) + (Satisfaction with construction/refurbishment service X related weight) • This dimension performance feeds into the “Performance Drivers Index”.
Frequency	Every six months
Who measures?	Co-Location Project Manager
Source of data	Performance indicators of: <ul style="list-style-type: none"> ○ Continuity of educational activities ○ End-users’ involvement ○ Satisfaction with construction/refurbishment service
Who acts on the data?	Senior co-located institutions management, Co-Location Project Manager
Notes and comments	The key performance indicators relating to this performance dimension need to be calculated before measuring this dimension.

Dimension title	<i>Collaborative Building Development</i>
Type	Performance drivers dimension
Definition	This dimension measures the effectiveness of the joint management of the process of creating the physical products of construction or refurbishment that the co-located institutions undertake together.
Purpose of measurement	To increase the co-located institutions' competence in delivering the construction (refurbishment) project on time, within budget and to the required specifications
Weight	31%
Relates to	Performance Drivers Index
Method	<ul style="list-style-type: none"> • “Collaborative institutional management” performance = the performance of (Construction/refurbishment cost X related weight) + (Construction/refurbishment time X related weight) + (Construction/refurbishment matching specification X related weight) + (Efficient procurement function X related weight) • This dimension performance feeds into the “Performance Drivers Index”.
Frequency	Every six months
Who measures?	Co-Location Project Manager
Source of data	Performance indicators of: <ul style="list-style-type: none"> ○ Construction/refurbishment cost ○ Construction/refurbishment time ○ Construction/refurbishment matching specification ○ Efficient procurement function
Who acts on the data?	Senior co-located institutions management, Co-Location Project Manager
Notes and comments	The key performance indicators relating to this performance dimension need to be calculated before measuring this dimension.

Dimensions of Performance Results



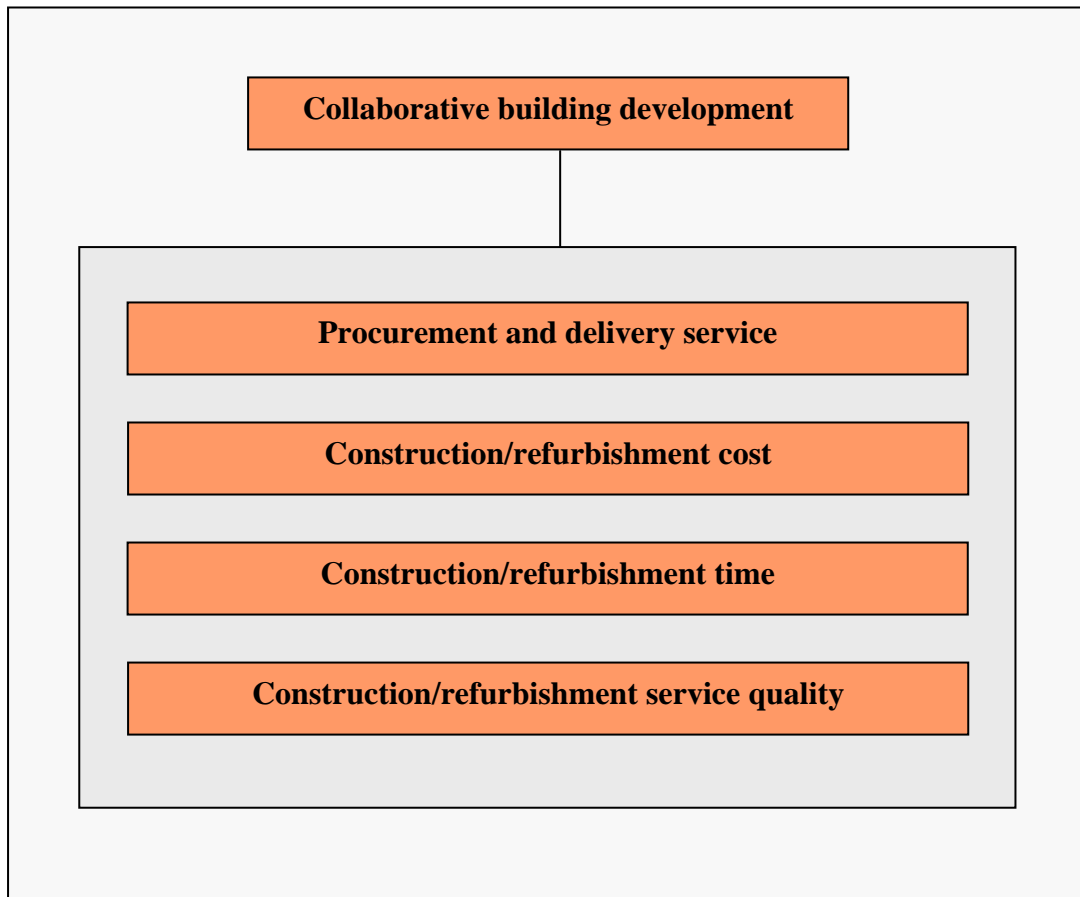
Dimension title	<i>Learning Built Environment</i>
Type	Performance results dimension
Definition	This dimension measures the quality of the physical environment within which teaching, research and other learning activities take place.
Purpose of measurement	<ul style="list-style-type: none"> • To increase efficiency and effectiveness of completing shared teaching activities • To provide the basis for interaction among students/staff and between students and educational services and facilities • To provide the physical settings that can inform students and staff behaviour in a way that contributes to the formation of a collaborative culture
Weight	43%
Relates to	Performance results index
Method	<ul style="list-style-type: none"> • “Collaborative institutional management” performance = the performance of (Space efficiency X related weight) + (Space productivity X related weight) + (Cost effectiveness X related weight) + (Building quality X related weight) + (satisfaction with shared space X related weight) + (satisfaction with the shared services and facilities X related weight) • This dimension performance feeds into the “Performance results index”.
Frequency	Every six months
Who measures?	Co-Location Project Manager
Source of data	Performance indicators of: <ul style="list-style-type: none"> ○ Space efficiency ○ Space productivity ○ Cost effectiveness ○ Building quality ○ Student/staff satisfaction with shared space ○ Student/staff satisfaction with the shared services and facilities
Who acts on the data?	Senior co-located institutions management, Co-Location Project Manager
Notes and comments	The key performance outcomes relating to this performance dimension need to be calculated before measuring this dimension.

Dimension title	<i>Collaborative Educational Provision</i>
Type	Performance results dimension
Definition	This dimension measures the outcomes of providing sufficient and good quality shared teaching, research and learning resources.
Purpose of measurement	<ul style="list-style-type: none"> • To focus on the campus reputation as good quality education provider • To attract more students (domestic, national and international students) • To attract high quality staff • To promote good performance from students and encourage them to progress into higher degrees and qualifications.
Weight	36%
Relates to	Performance results index
Method	<ul style="list-style-type: none"> • “Collaborative institutional management” performance = performance indicators of (Student recruitment X related weight) + (Student retention X related weight) + (Staff retention X related weight) + (Student achievements X related weight) + (Students’ satisfaction with the shared education X related weight) • This dimension performance feeds into the “Performance results index”.
Frequency	Every six months
Who measures?	Co-Location Project Manager
Source of data	Performance indicators of: <ul style="list-style-type: none"> ○ Student recruitment ○ Student retention ○ Staff retention ○ Student achievements ○ Students’ satisfaction with the shared education
Who acts on the data?	Senior co-located institutions management, Co-Location Project Manager
Notes and comments	The key performance outcomes relating to this performance dimension need to be calculated before measuring this dimension.

Dimension title	<i>Co-location Sustainability</i>
Type	Performance results dimension
Definition	This dimension measures environmental, social, cultural and economical impacts on the local community
Purpose of measurement	To promote an ethical and practical response to impacts that the co-location campus has on different aspects of the surrounding community.
Weight	21%
Relates to	Performance results index
Method	<ul style="list-style-type: none"> • “Collaborative institutional management” performance = performance indicators of (Social impact on community X related weight) + (Economic impact on community X related weight) + (Environmental impact on community X related weight) • This dimension performance feeds into the “Performance results index”.
Frequency	Every six months
Who measures?	Co-Location Project Manager
Source of data	Performance indicators of: <ul style="list-style-type: none"> ○ Social impact on community ○ Economic impact on community ○ Environmental impact on community
Who acts on the data?	Senior co-located institutions management, Co-Location Project Manager
Notes and comments	The key performance outcomes relating to this performance dimension need to be calculated before measuring this dimension.

Performance Drivers

(Collaborative building development)



Indicator title	<i>Procurement and delivery service</i>
Type	Performance drivers measure
Definition	This measure indicates how competent the co-located institutions are in providing efficient construction procurement functions.
Purpose	<ul style="list-style-type: none"> • To cut unnecessary costs and save money • To reduce time and effort needed in making regular buying of goods and services (including construction services);
Weight	16%
Relates to	Collaborative building development
Method	<ul style="list-style-type: none"> • Identify the targeted maturity level • Identify the current maturity level based on the maturity matrix provided • “Efficient procurement function” performance indicator= $\frac{\text{Current level} - \text{Target level}}{\text{Targeted level}} \times 100$ • The result feeds into “Collaborative building development” performance measurement.
Frequency	Quarterly, every six months
Who measures?	Co-location project manager
Source of data	Project documentation, procurement reports
Who acts on the data?	Co-location project manager
Notes and comments	

Maturity matrix:

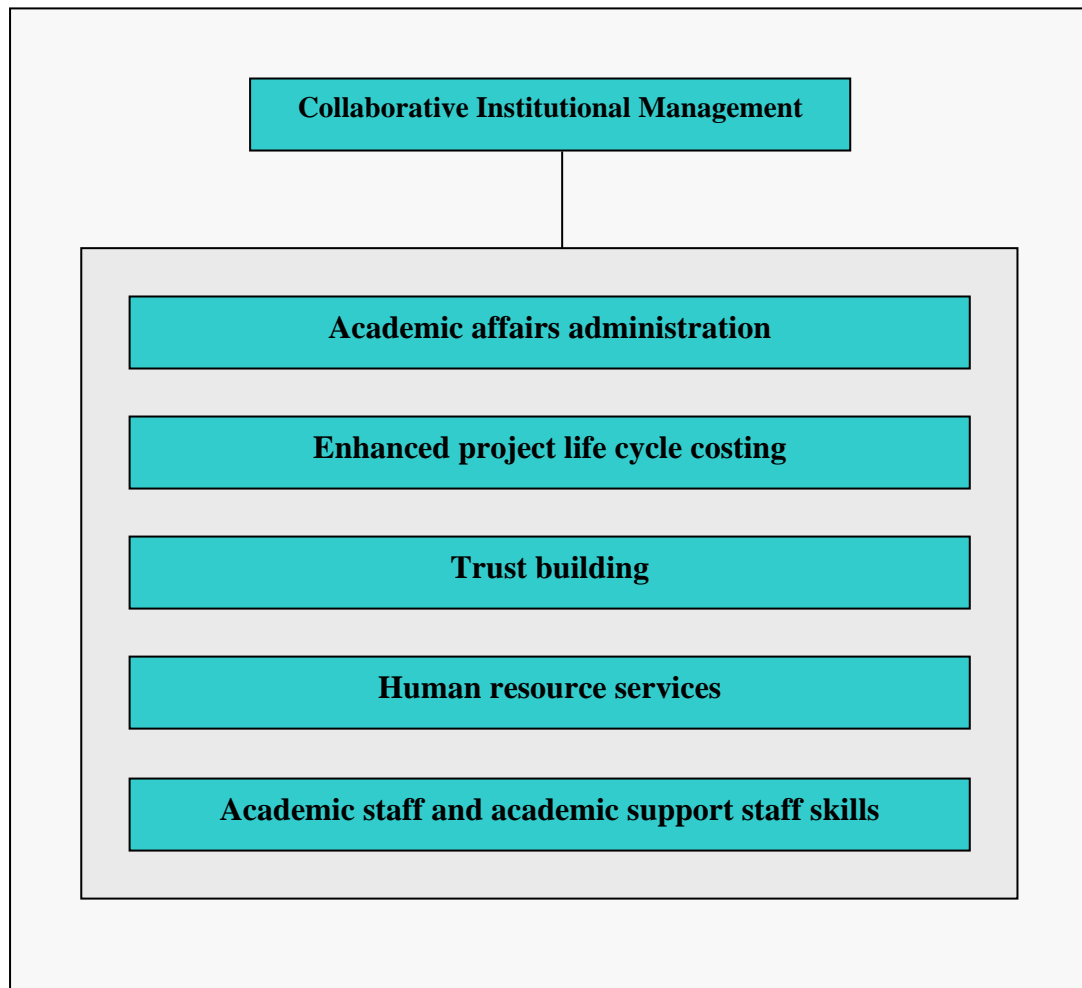
Level 1	Level 2	Level 3	Level 4	Level 5
<p>The procurement route is selected based on incomplete analysis of functional needs.</p> <p>Contractual arrangements that support and supplement the selected procurement route are not well defined.</p>	<p>General guidelines for selecting the procurement route are established.</p> <p>General guidelines for selecting the contractor (in accordance with the procurement route) are established.</p> <p>A framework that determines contractual arrangements between the co-located institutions side and contractor side is established.</p>	<p>Criteria for selecting the appropriate procurement route are detailed.</p> <p>Criteria for selecting the appropriate contractor are detailed.</p> <p>Contractual agreements are detailed.</p>	<p>Selection of the most suitable procurement route is based on a systematic process and defined criteria.</p> <p>Selection of the most suitable contractor(s) is based on a systematic process and defined criteria.</p> <p>The contractual agreements between the co-located institutions and the contractor are formalised and followed.</p>	<p>The co-located institutions regularly evaluate the systematic selection processes of both the most suitable procurement route and the most suitable contractor.</p> <p>Analysis of the most suitable form of relationship between the co-located institutions and the contractor is carried out.</p>

Outcome title	<i>Construction/Refurbishment Time</i>
Type	Performance drivers measure
Definition	This measure indicates the time prediction performance of construction/refurbishment process.
Purpose of measurement	<ul style="list-style-type: none"> • To improve project planning and scheduling • To improve project control and take corrective actions
Relates to	Collaborative building development
Target	29%
Method	<ul style="list-style-type: none"> • Identify actual and target (predicted) construction project time • “Construction/refurbishment time” performance indicator= $\frac{\text{Actual time} - \text{Predicted time}}{\text{Predicted time}} \times 100$ • The result feeds into “Collaborative building development” performance measurement.
Frequency	Quarterly, or based on Project Gateways
Who measures?	Co-location project manager
Source of data	Construction project documentation
Who acts on the data?	Co-location project manager
Notes and comments	Construction/refurbishment project starts with the contract being awarded to the contractor and ends when the construction product (co-location campus) is handed over.

Outcome title	<i>Construction/Refurbishment Cost</i>
Type	Performance drivers measure
Definition	This measure indicates the cost prediction performance of the construction/refurbishment process.
Purpose of measurement	<ul style="list-style-type: none"> To improve project cost planning, monitoring and control
Relates to	Collaborative building development
Target	29%
Method	<ul style="list-style-type: none"> To identify actual and target (predicted) construction project cost “Construction/refurbishment cost” performance indicator= $\frac{\text{Actual cost} - \text{Predicted cost}}{\text{Predicted time}} \times 100$ The result feeds into “Collaborative building development” performance measurement.
Frequency	Quarterly, or based on Project Gateways
Who measures?	Co-location project manager
Source of data	Construction project documentation
Who acts on the data?	Co-location project manager
Notes and comments	Construction/refurbishment project starts with the contract being awarded to the contractor and ends when the construction product (co-location campus) is handed over.

Indicator title	<i>Construction/Refurbishment Service Quality</i>
Type	Performance drivers measure
Definition	This measure indicates the level to which the output of the construction project conforms to their specifications.
Purpose of measurement	<ul style="list-style-type: none"> To explore the client's (co-located institutions) perceptions about the construction contractor's services To improve service quality
Weight	26%
Relates to	Collaborative building development
Method	<ul style="list-style-type: none"> Identify a target for satisfaction level Conduct a survey questionnaire to assess the satisfaction level of the client side (co-location institutions) with the provision of quality contracting services The measured satisfaction level needs to be between 0 and 100. The performance indicator of “conformance to specifications” = $\frac{\text{Current satisfaction level} - \text{Targeted satisfaction level}}{\text{Targeted satisfaction level}} \times 100$ This performance feeds into “Collaborative building development” performance measurement.
Frequency	Quarterly, every six months
Who measures?	Co-location project manager
Source of data	Audits and surveys
Who acts on the data?	Co-location project manager
Notes and comments	<p>The following criteria could be considered when assessing satisfaction levels:</p> <ul style="list-style-type: none"> Completeness = The amount of items on the punch list upon completion of the project The ability to perform the right job the first attempt

(Collaborative Institutional Management)



Indicator title	<i>Administration Process</i>
Type	Performance drivers measure
Definition	This measure indicates how effective the co-located institutions are in administering a broad array of academic affairs services and competencies that provide fundamental academic support functions.
Purpose of measurement	<ul style="list-style-type: none"> • To ensure and maintain good quality shared facilities and services • To promote efficient and effective management of educational support functions.
Weight	30%
Relates to	Collaborative institutional management
Method	<ul style="list-style-type: none"> • Identify the targeted maturity level • Identify the current maturity level based on the maturity matrix provided • “Academic administration” performance indicator = $\frac{\text{Current level} - \text{Target level}}{\text{Targeted level}} \times 100$ • The result feeds into “Collaborative institutional management” performance measurement
Frequency	Every six months
Who measures?	Timetabler, Assistant Principal
Source of data	Documents of academic support arrangements, Documentation of performance evaluation, Co-location institutions management reports
Who acts on the data?	Co-location project manager, Campus service manager, Vice Principal - Academic Affairs, Assistant Principal
Notes and comments	<p>Focus group workshop might be needed to decide the overall capability maturity level.</p> <p>Strategies need to be measured annually.</p> <p>Other activities can be measured on a 6-monthly basis.</p>

Maturity matrix:

Level 1	Level 2	Level 3	Level 4	Level 5
Goals and objectives of collaborative administration of the co-location are established.	Procedures, guidance, information and statistics supporting the co-location academic objectives are established.	Strategic plans of co-location collaborative administration are established.	Strategies are reviewed and updated.	Updates are incorporated into strategies and plans to reflect changing circumstances.
Applications are received and commented on individually by the FE/HE co-located institutions.	Admission requirements and criteria are established for all articulated modules, courses and programmes.	Collaborative team from co-located institutions is formed to receive, comment and make decisions on applications for all articulated modules, courses and programmes.	Admission criteria are assessed and reviewed to meet updates in the articulated modules, courses and programmes.	Revised admission criteria are incorporated into student recruitment strategies and plans.
Areas of teaching, research and other educational activities for all articulated modules, courses and programmes are provided on an <i>ad hoc</i> basis.	Areas of teaching, research and other educational activities for all articulated modules, courses and programmes are allocated.	Timetables and areas available for teaching, research and other educational activities are scheduled and allocated for all articulated modules, courses, and programmes.	Timetables and spaces available for teaching, research and for other educational activities all articulated modules, courses and programmes are reviewed.	Space planning and management plans are updated periodically.
The co-located institutions have individual regulations and advice on student issues.	The co-located institutions work together to develop joint regulations and advice on student issues.	A joint team is formed to provide advice on student issues.	Joint regulations and advice on student issues are monitored and evaluated.	Student advice procedures are amended regularly to ensure good service quality.

Indicator title	<i>Life Cycle Costing</i>
Type	Performance drivers measure
Definition	Life Cycle Costing (LCC) is a method by which the total costs that arise during the project life are considered. This measure indicates the capability of the co-located institutions to define the whole life costs of obtaining, running and maintaining the co-location campus.
Purpose of measurement	<ul style="list-style-type: none"> • To provide life cycle cost management • To ensure cost-effectiveness • To identify project risks and minimise their impacts
Weight	30%
Relates to	Collaborative institutional management
Method	<ul style="list-style-type: none"> • Identify the targeted maturity level • Identify the current maturity level based on the maturity matrix provided • “Enhanced project life cycle costing” performance indicator= $\frac{\text{Current level} - \text{Target level}}{\text{Targeted level}} \times 100$ • The result feeds into “Collaborative institutional management” performance measurement.
Frequency	Quarterly, every six months
Who measures?	Co-location project manager, finance managers
Source of data	Co-location project costs documentation, institutions' financial statements
Who acts on the data?	Co-location project manager, Finance directors
Notes and comments	Focus group workshop might be needed to decide the overall performance level.

Maturity matrix:

Level 1	Level 2	Level 3	Level 4	Level 5
<p>The co-located institutions provide the information required to develop alternative enterprise solutions.</p> <p>Project risks are identified.</p> <p>Project cost information is gathered (a quantified estimate of the maintenance and other support costs incurred by operating the proposed building, including the costs of disposal).</p> <p>Documents that describe the scope and other project attributes required to estimate the co-located project costs are prepared.</p>	<p>Financial aspects of the conceptual project alternatives are considered by the co-located institutions.</p> <p>Risk analysis is preformed.</p> <p>Estimate information is developed and documented.</p> <p>The co-location project is broken down into project work streams.</p> <p>Estimate basis and assumptions are prepared.</p>	<p>Project feasibility study and financial projections are prepared.</p> <p>Risks are defined and evaluated; plans to mitigate each risk are established.</p> <p>Planned and actual project progress and costs are compared.</p> <p>Cost allocations and procedures for collecting and reporting cost data are defined.</p> <p>Estimate packages are prepared.</p>	<p>Conclusions of feasibility study need to be confirmed and supported by studies conducted by independent consultant(s).</p> <p>Risks are monitored and mitigated.</p> <p>Costs are continuously monitored and controlled through the whole life of the co-location project.</p> <p>Cost allocations and procedures for collecting and reporting cost data are reviewed.</p> <p>Estimates are reconciled with the baseline and differences explained</p>	<p>Feasibility study, financial projections, and other supporting studies confirm that the co-location project will be created according to its predetermined monetary constraints.</p> <p>Risks are archived and updated.</p> <p>Learning from modelling errors to improve costing practices.</p> <p>Estimate basis and assumptions are reviewed and monitored for taking corrective actions when needed;</p> <p>Historical cost data collected for the co-location project are analysed and results are documented.</p>

Indicator title	<i>Trust Building</i>
Type	Performance drivers measure
Definition	This measure indicates how developed the co-located institutions are in building and managing their trust when working collaboratively.
Purpose of measurement	<ul style="list-style-type: none"> • To develop confidence between the co-located institutions • To increase reliability among the co-located institutions
Weight	20%
Relates to	Collaborative institutional management
Method	<ul style="list-style-type: none"> • Identify the targeted maturity level • Identify the current maturity level based on the maturity matrix provided • “Trust building” performance indicator= $\frac{\text{Current level} - \text{Target level}}{\text{Targeted level}} \times 100$ • The result feeds into “Collaborative institutional management” performance measurement.
Frequency	Every six months
Who measures?	Co-location project manager
Source of data	Project documents and observations
Who acts on the data?	Co-location project manager
Notes and comments	Focus group workshop might be needed to decide the overall capability maturity level.

Maturity matrix:

Level 1	Level 2	Level 3	Level 4	Level 5
Limited interactions between the co-located institutions owing to a limited number of joined or shared tasks.	Staff of institutions initiate cooperative behaviour based on their own norms.	The norms, rules and standards that guide interaction behaviour of the co-located institution are established.	Interactions that develop over time are recorded and documented.	Interactions are consistent and predictable over an extended period of time
The co-located institutions lack understanding of each other's competencies.	Competencies of the co-located institutions are well articulated.	A high level of engagement and interaction occurs among the staff of the co-located institutions.	The staff of the co-located institutions are experienced in working with each other.	Incentives exist for trustworthy behaviour.
There is little understanding of shared goals of the co-location.	Specifics of the relationship, the investment made and the adaptation needed are formalised between the co-located institutions.	The co-located institutions try to act in accordance with any commitments or agreements.	Training is provided to enhance trustworthy behaviour.	Trustworthiness is integrated into the organisation's value system.
The style or structure of the partnership is not clear.	Thorough mutual learning towards the specifics of the partnership is happening.	The rules and responsibilities of the individuals involved in the partnership are established.	High levels of commitment are shown towards the other institution.	The co-located institutions ensure that their staff behave in a trustworthy manner.
	Comprehensive dialogue regarding the style and structure of the relationship is made.	The style and structure of the relationship is formed.	Each institution adheres to the specific written or verbal agreements and acts with equality.	The co-located institutions developed a trustworthy relationship.

Indicator title	<i>Staff and human resource development</i>
Type	Performance drivers measure
Definition	This measure indicates how competent the co-located institutions are in developing and managing shared human resources services.
Purpose of measurement	<ul style="list-style-type: none"> To enhance effectiveness of shared HR processes required to coordinate the human resources services for the co-location project To increase effectiveness of HR service
Weight	16%
Relates to	Collaborative institutional management
Method	<ul style="list-style-type: none"> Identify the targeted maturity level Identify the current maturity level based on the maturity matrix provided “HR services” performance indicator= $\frac{\text{Current level} - \text{Target level}}{\text{Targeted level}} \times 100$ The result feeds into “Collaborative institutional management” performance measurement.
Frequency	Every six months
Who measures?	Co-location project manager, HR managers
Source of data	HR strategies policies and procedures, staff roles and responsibilities documentation, staff performance management documentation
Who acts on the data?	Co-location project manager, HR managers
Notes and comments	Focus group workshop might be needed to decide the overall capability maturity level.

Maturity matrix:

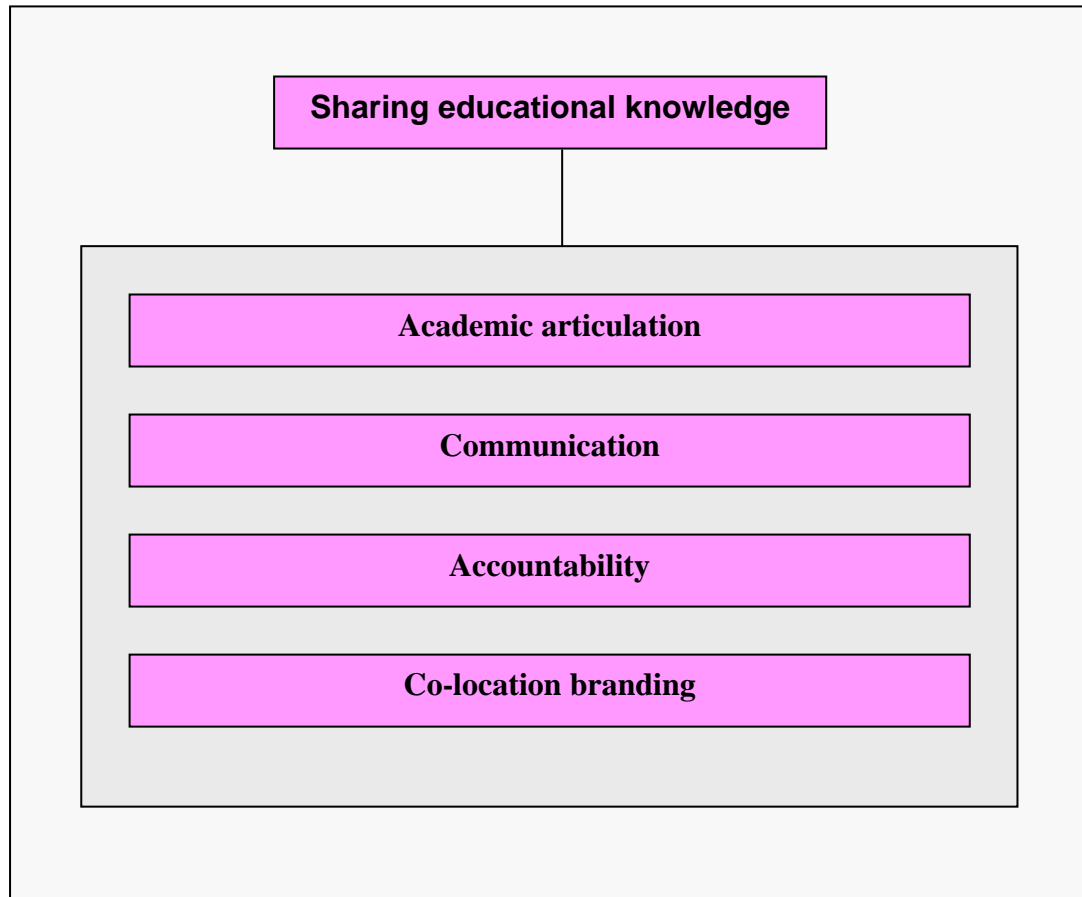
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Information regarding competencies required for the academic work and administration of the co-located campus is gathered by participating institutions.</p> <p>The co-located institutions establish individual and team objectives Individually (i.e. objectives are not shared).</p>	<p>Competencies required for the academic work and administration of the co-located campus are determined.</p> <p>Number of staff required for the co-location is determined.</p> <p>Plans for the co-location project team building are established.</p> <p>Shared individual and team objectives are established for different work streams.</p>	<p>Detailed guidelines policies and procedures of human resource categories, staff required, time they are required for, skills and level of proficiency, staffing and recruiting are established and documented.</p> <p>Individual and team roles, responsibilities and commitments are established for the different co-location project activities and work streams.</p> <p>Staff performance expectations and measurements against which the teams and individuals performance will be assessed are set.</p>	<p>Guidelines policies and procedures of human resource services are evaluated.</p> <p>Performance of the co-location campus staff is monitored and evaluated.</p>	<p>Guidelines policies and procedures of human resource services are reviewed and updated.</p> <p>Good performance is acknowledged and rewarded.</p>

Indicator title	<i>Teaching Skills of the Academic Staff</i>
Type	Performance drivers measure
Definition	This measure indicates how competent the co-located institutions are in enhancing the skills of the academic staff and academic support staff to meet the requirements of the shared educational provision.
Purpose of measurement	<ul style="list-style-type: none"> • To enhance the skills of the academic and academic support staff of the co-location campus • To respond to changes imposed by the shared campus • To increase effectiveness of learning and teaching processes
Weight	12%
Relates to	Collaborative institutional management
Method	<ul style="list-style-type: none"> • Identify the targeted maturity level • Identify the current maturity level based on the maturity matrix provided • “Academic and academic support staff skills” performance indicator= $\frac{\text{Current level} - \text{Target level}}{\text{Targeted level}} \times 100$ • The result feeds into “Collaborative institutional management” performance measurement.
Frequency	Every six months
Who measures?	Teaching and learning directors, research directors,
Source of data	Training needs documentation, academic and academic support staff performance measurement documentation, academic and academic support staff development plans
Who acts on the data?	Co-location project manager, directors of teaching and learning and research, principal assistants
Notes and comments	Focus group workshop might be needed to decide the overall capability maturity level.

Maturity matrix:

Level 1	Level 2	Level 3	Level 4	Level 5
Individual performance is assessed.	<p>Gaps in academic and academic support staff performance are specified.</p> <p>Training needs of academic and academic support staff are identified and analysed.</p>	<p>Personal development planning is established based on training needs analysis.</p> <p>Consistent and co-ordinated development programmes are based primarily on functions and roles rather than on staff categories.</p>	<p>The personal development planning process is instituted and approved by senior management.</p> <p>Academic and academic support staff training needs are measured regularly.</p> <p>Improvements in performance of academic and academic support staff are identified.</p>	<p>Benefits of the development programmes are reviewed and evaluated to ensure that they are linked to the co-location objectives and priorities.</p> <p>Staff development is linked to their appraisal and personal career development planning.</p> <p>Logs or portfolios which record individuals' professional development and training are set up.</p>

(Sharing educational knowledge)



Indicator title	<i>Academic Articulation</i>
Type	Performance drivers measure
Definition	Academic articulation measures the process by which the co-located institutions introduce formal and documented arrangements that are necessary so that students can transfer from one course, programme or educational level from one institution to another at other co-located institutions.
Purpose of measurement	<ul style="list-style-type: none"> To provide well-articulated academic links between the co-located institutions To ensure smooth student progression within the co-located institutions.
Weight	39%
Relates to	Sharing educational knowledge
Method	<ul style="list-style-type: none"> Identify the targeted maturity level Identify the current maturity level based on the maturity matrix provided “Academic articulation” performance indicator= $\frac{\text{Current level} - \text{Target level}}{\text{Targeted level}} \times 100$ The result feeds into “Sharing educational knowledge” performance measurement.
Frequency	Quarterly, every six months;
Who measures?	Articulated module, course and programme leaders
Source of data	Co-located institution’s academic plans, learning and teaching board, curriculum, course and programme development policies
Who acts on the data?	Co-location project manager, Directors of Teaching and Learning, Director of Curriculum and Quality, Assistant Principal
Notes and comments	Focus group workshop might be needed to decide the overall capability maturity level.

Maturity matrix:

Level 1	Level 2	Level 3	Level 4	Level 5
<p>The similarity and heterogeneity of the co-located institutions' respective knowledge is identified.</p> <p>The academic competencies that one institution requires students from the other institution's programmes to possess are identified.</p> <p>Academic staff of the co-located institutions work individually to set learning and development outcomes for the academic articulation.</p>	<p>Knowledge required for developing shared modules, courses and programmes is identified.</p> <p>The co-located institutions identify courses or programmes that will form pathways for student progression within or between the co-located institutions.</p> <p>Academic staff of the co-located institutions work together to set the learning and development outcomes for academic articulation.</p>	<p>Teaching and research knowledge base is developed based on clearly identified and codified knowledge.</p> <p>References guidelines, models and standards of the articulated pathways are fully developed.</p> <p>Collaborative teams have clear roles and responsibilities.</p>	<p>The "educational knowledge transfer system" to collect, synthesise, and disseminate educational knowledge and make it more readily accessible to staff and students is developed across the co-locating institutions.</p> <p>Mechanisms of monitoring and evaluating the progression process are detailed and documented.</p> <p>Collaborative teams update articulated modules, programmes and activities.</p>	<p>The "educational knowledge management system" focuses on optimising and continuously improving the academic articulation process.</p> <p>Feedback on progression process is used to improve the process.</p> <p>The benefits gained by students who progress through the articulated pathways are established.</p>

Indicator title	<i>Effective Communication</i>
Type	Performance drivers measure
Definition	Communication is a process by which information is exchanged between the co-located institutions. This measure indicates how competent the co-located institutions are in developing communication with each other so that they can manage the co-location project activities more effectively.
Purpose of measurement	<ul style="list-style-type: none"> • To increase project management effectiveness • To promote and develop partnership between the co-located institutions • To increase interaction among student and staff of the collocated institutions through enhanced interpersonal, group and organisational communication
Weight	29%
Relates to	Sharing educational knowledge
Method	<ul style="list-style-type: none"> • Identify the targeted maturity level • Identify the current maturity level based on the maturity matrix provided • “Communication” performance indicator = $\frac{\text{Current level} - \text{Target level}}{\text{Targeted level}} \times 100$ • The result feeds into “Sharing educational knowledge” performance measurement.
Frequency	Quarterly, every six months
Who measures?	Co-location project manager, IT managers
Source of data	Institution’s observation, surveys, audits
Who acts on the data?	Co-location project manager, Directors of planning, Directors of teaching and learning
Notes and comments	Focus group workshop might be needed to decide the overall capability maturity level.

Maturity matrix:

Level 1	Level 2	Level 3	Level 4	Level 5
<p>Informal, more self-organised communication structures are used.</p> <p>Communication channels (face-to-face, written, verbal, nonverbal, visual, or electronic communication) emerge through individual relationships or contacts between individuals who are willing to co-operate are established</p> <p>Communication tends to be natural with spontaneous interaction.</p> <p>The proposed goals of educational knowledge exchange are established.</p> <p>The shared ICT infrastructure is installed and developed as reactive activities according to demanding situations.</p> <p>Technical support for the design and planning, deployment, and operation activities of the shared ICT lacks suitable skills, knowledge and resources.</p>	<p>Information is transferred through informal communication among students and staff.</p> <p>Communication systems, channels, are structured.</p> <p>The level of interaction is subject to group norms with limited feedback and with spontaneous interaction.</p> <p>General guidelines for the development and installation of shared ICT infrastructure are developed.</p> <p>Technical support provides basic skills, knowledge and resources necessary for the shared ICT.</p>	<p>Information is transferred through formal and informal communication between staff and students.</p> <p>Information exchange is recorded for future reference.</p> <p>Information is controlled through well-established channels and systems so that individuals do not experience information overload and they receive information they need.</p> <p>Appropriate plans and strategies for the development and installation of the shared ICT infrastructure are standardised and documented for future use.</p> <p>The competencies required to support the design and planning, deployment, and operation activities of the shared ICT are defined.</p>	<p>Interpersonal communication is observed and recorded to identify effective communication.</p> <p>The direction of the communication movement is clear and in relation to the project organisation hierarchy system; identified communication obstacles are analysed.</p> <p>Specified rules and procedures are followed when communicating.</p> <p>Educational knowledge exchange is captured, evaluated, assimilated and used in developing and updating existing knowledge.</p> <p>Appropriate plans and strategies for the development and installation of the shared ICT infrastructure are continuously reviewed to meet the learning needs.</p> <p>Necessary competencies are reviewed and evaluated to support the shared ICT.</p>	<p>A profile of effective interpersonal communication between and among student/staff is built up.</p> <p>The profile is used as a reference to update training of student/staff and newcomers.</p> <p>The form and content of the communication reflect the co-located institutions' values, beliefs, assumptions and perceptions.</p> <p>New educational knowledge is developed and adopted in order to acquire competitive advantage through academic quality enhancement and innovation of the co-locating institutions.</p> <p>Plans and strategies for the development and installation of the shared ICT infrastructure are constantly modified to assure education needs are met.</p> <p>Changes made to ICT operations have minimum impact possible on the educational processes.</p> <p>Required competencies are updated and improved.</p>

Indicator title	Accountability – Meeting the needs of potential applicants for education and professional development
Type	Performance drivers measure
Definition	This measure indicates the capability of the co-located institutions to determine the needs and wants of students and education markets.
Purpose of measurement	<ul style="list-style-type: none"> • To provide up-to-date educational knowledge • To enhance accountable of students and potential applicants • To increase student satisfaction with the contents of educational programmes.
Weight	20%
Relates to	Sharing educational knowledge
Method	<ul style="list-style-type: none"> • Identify the targeted maturity level • Identify the current maturity level based on the maturity matrix provided • “Accountability” performance indicator= $\frac{\text{Current level} - \text{Target level}}{\text{Targeted level}} \times 100$ • The result feeds into “Sharing educational knowledge” performance measurement.
Frequency	Every six months, annually
Who measures?	Curriculum, courses and programme developers
Source of data	Co-located institution’s academic plans, learning and teaching board, curriculum, course and programme development policies
Who acts on the data?	Co-location project manager, Director of Teaching and Learning, Assistant Principal
Notes and comments	Focus group workshop might be needed to decide the overall capability maturity level.

Maturity matrix:

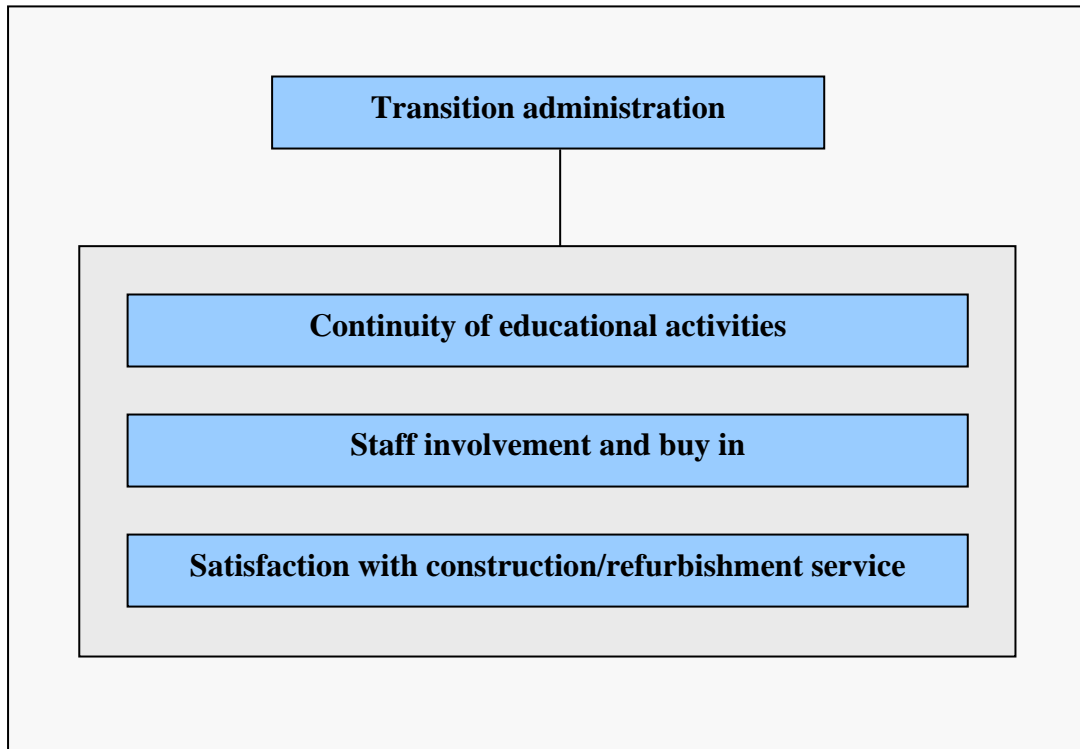
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Understanding the education markets and the needs of the students that make up this market is intuitive or based on common sense.</p> <p>Potential applicants' needs, wants and expectations of educational services are captured.</p> <p>New curriculum, courses or programmes are developed, based on common sense understanding of market needs and student needs.</p>	<p>Market research to find out learning needs is conducted.</p> <p>The current levels of knowledge and expertise that the co-located institutions are supposed to provide, are identified.</p> <p>New curriculum, courses or programmes are developed, based on incomplete data analysis of market research.</p>	<p>Market needs and student needs are analysed.</p> <p>Current levels of knowledge and expertise are analysed.</p> <p>New curriculum, courses or programmes are developed, based on analysed data of market needs and student needs.</p>	<p>Market needs are identified and documented.</p> <p>Levels of knowledge and expertise are classified and documented.</p> <p>Methods of developing new curriculum, courses or programmes are standardised.</p>	<p>Education market trends and student needs trends are identified and documented.</p> <p>The levels of knowledge and expertise that the co-located institutions are supposed to provide are continuously reviewed, evaluated and updated.</p> <p>Methods of developing new curriculum, courses or programmes are reviewed and evaluated to respond to any changing market needs, and student needs are identified and responded to.</p> <p>The community is partly involved in the educational planning and developing of courses, programmes or learning activities.</p>

Indicator title	Branding – Promoting the Co-located Institution
Type	Performance drivers measure
Definition	This measure indicates the capability of the co-located institutions to promote the strengths and benefits of sharing educational facilities and services to students and potential applicants within an environment of international competition.
Purpose of measurement	<ul style="list-style-type: none"> • To present the strengths and benefits of sharing a campus with other educational institutions • To ensure good image management of the co-location campus • To attract more national and international students • To promote good relationship with the community.
Weight	12%
Relates to	Sharing educational knowledge
Method	<ul style="list-style-type: none"> • Identify the targeted maturity level • Identify the current maturity level based on the maturity matrix provided • “Branding” performance indicator= $\frac{\text{Current level} - \text{Target level}}{\text{Targeted level}} \times 100$ • The result feeds into “Sharing educational knowledge” performance measurement.
Frequency	Every six months
Who measures?	Marketing manager, Head of Marketing & Public Relations
Source of data	University/College marketing strategies and plans
Who acts on the data?	Co-location project manager, director of corporate communications, business development manager
Notes and comments	<ul style="list-style-type: none"> • Focus group workshop might be needed to the overall capability maturity level. • Strategies need to be measured annually. • Other activities can be measured on a 6 monthly basis.

Maturity matrix:

Level 1	Level 2	Level 3	Level 4	Level 5
<p>The co-located institutions work in partnership to develop a shared vision of marketing the co-located campus.</p> <p>Reasons for choosing the co-located institutions are collected.</p> <p>Strengths and competencies the co-location campus is trying to offer are identified.</p>	<p>Marketing and image building strategies are developed.</p> <p>Data analysis is performed.</p> <p>Education market position is identified based on market research and analysis; sufficient information on the strengths and competencies the co-location project is trying to offer are provided.</p>	<p>Detailed action plans are developed on the basis of the developed strategies.</p> <p>Student choice factors are identified.</p> <p>Education market orientation and customer focus are captured.</p> <p>Institutional image is defined and presented using strengths and competencies of the co-location project.</p>	<p>Marketing progress is monitored and evaluated.</p> <p>Institution selection factors identified by students are compared with the information that had been given by the co-located institutions in their marketing communications.</p> <p>Institutional image (how students and staff perceive the FE/HE co-location) is measured and analysed (using marketing research techniques like surveys, interviews and observations; marketing strategies, tools and techniques are reviewed and evaluated).</p>	<p>Updates are incorporated into strategies and plans to reflect changing circumstances.</p> <p>Students' different media preferences which might be related to differences in their cultural values are captured and reacted upon; gaps are highlighted.</p> <p>Gaps that are highlighted are analysed and results are integrated into new promotional materials.</p> <p>The co-located institutions maintain relationships with current and prospective students, alumni, faculty, staff, parents, and the community.</p>

(Transition administration)



Indicator title	<i>Minimising disruption during delivery stage</i>
Type	Performance drivers measure
Definition	This measure indicates how effective the co-located institutions are in minimising disruption to the ongoing educational activities during times of development work on the co-located campus.
Purpose of measurement	<ul style="list-style-type: none"> To maintain continuity of teaching, research and learning activities during the campus transformation To improve procedures developed to minimise impact of change happening by co-locating a number of educational institutions together
Weight	48%
Relates to	Transition administration
Method	<ul style="list-style-type: none"> Identify the targeted maturity level Identify the current maturity level based on the maturity matrix provided “Continuity of educational activities” performance indicator = $\frac{\text{Current level} - \text{Target level}}{\text{Targeted level}} \times 100$ The result feeds into “Transition administration” performance measurement.
Frequency	Quarterly, every six months
Who measures?	Co-location project manager, campus service manager
Source of data	Project plans, project reports, module, course and programme schedules
Who acts on the data?	Co-location project manager, timetabler, directors of teaching and learning
Notes and comments	Focus group workshop might be needed to decide the overall capability maturity level.

Maturity matrix:

Level 1	Level 2	Level 3	Level 4	Level 5
Possible disruptions to teaching, research and learning activities are identified.	Possible implications of disruptions to teaching, research and learning activities are identified.	Emergency plans and safety measures are developed.	<p>Disruptions and their implications are communicated.</p> <p>Safety measures are communicated.</p>	<p>Disruptions and their implications are communicated within sufficient time to permit applying contingency plans.</p> <p>Emergency plans are reviewed and updated.</p>

Indicator title	<i>Staff involvement and buy in</i>
Type	Performance drivers measure
Definition	This measure indicates how competent the co-located institutions are in involving end-users in understanding the benefits of sharing the services and facilities of one campus.
Purpose of measurement	<ul style="list-style-type: none"> • To engage the end-users of the co-locating institutions in the development process of the co-location project • To develop a sense of attachment and commitment among them • To assist the staff in coping with disruptions to their work situation • To enhance their output during the transition period.
Weight	25%
Relates to	Transition administration
Method	<ul style="list-style-type: none"> • Identify the targeted maturity level • Identify the current maturity level based on the maturity matrix provided • “End-users involvement” performance indicator = $\frac{\text{Current level} - \text{Target level}}{\text{Targeted level}} \times 100$ • The result feeds into “Transition administration” performance measurement.
Frequency	Every six months
Who measures?	Co-location project manager
Source of data	Institutional audits, project reports and documentation, surveys of student/staff perceptions and expectations
Who acts on the data?	Co-location project manager
Notes and comments	Focus group workshop might be needed to decide the overall capability maturity level.

Maturity matrix:

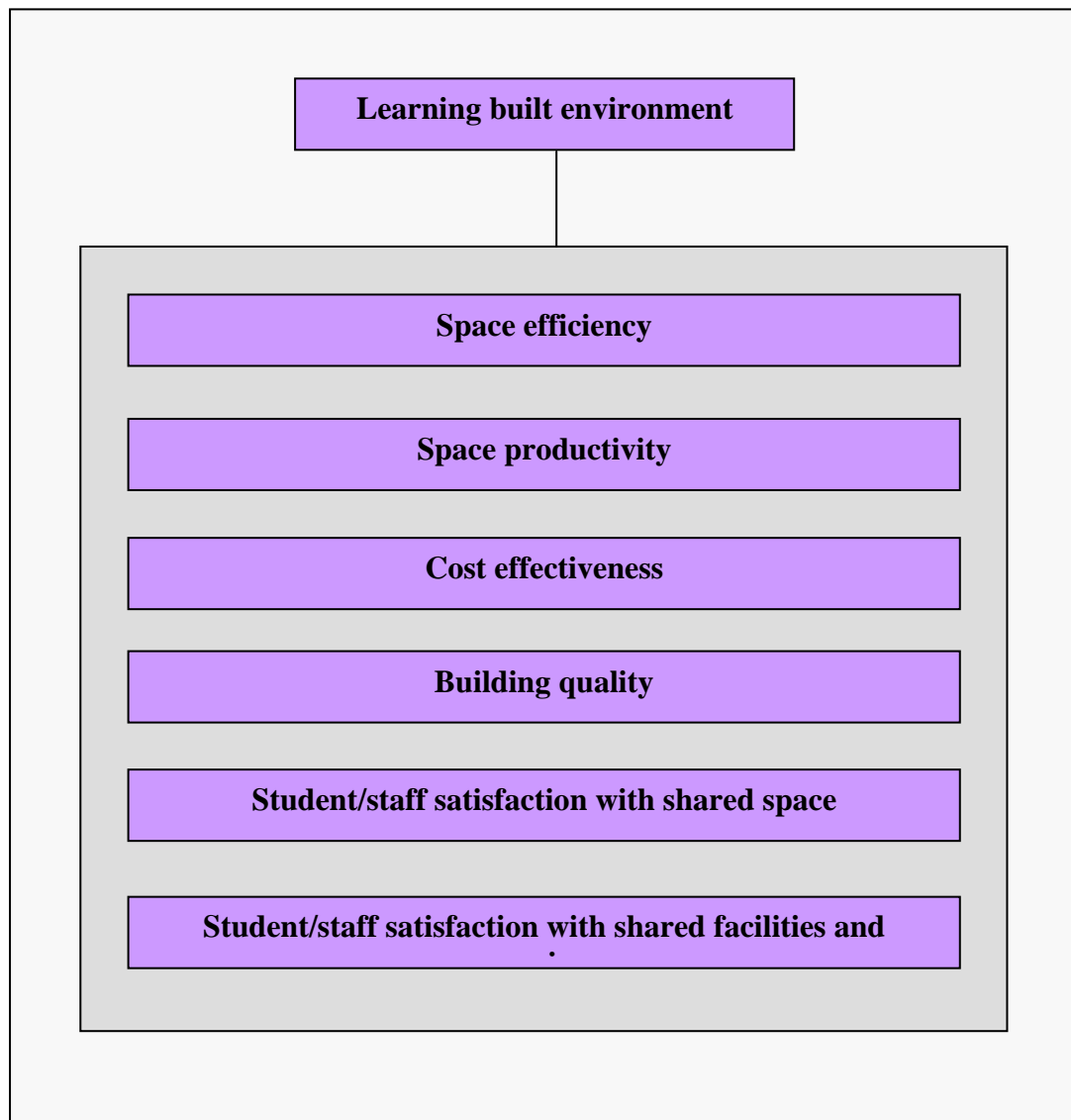
Level 1	Level 2	Level 3	Level 4	Level 5
<p>Staff and students of the co-location institution report problems in performing tasks caused by the project.</p>	<p>Challenges associated with the transition are identified.</p>	<p>Challenges associated with the transition are acknowledged and documented.</p>	<p>Updated transition information is passed to the co-location staff and students using their most preferred communication channels</p>	<p>The senior management of co-located institutions participate in discussing the shared education challenges to let staff and students know that the leadership acknowledges the difficulties they are facing</p>
<p>Staff and students of the co-located institutions are randomly involved in addressing matters directly related to their work and study conditions.</p>	<p>A joint team with members from all co-locating institutions is formed to address and manage the change in the transition period.</p>	<p>An engagement strategy that will enhance adaptation to the new shared campus is developed.</p> <p>Clear individual and team roles and responsibilities are defined.</p>	<p>Forces that are blocking adaptation to the new situation and determine possible solutions are identified.</p> <p>The identified forces blocking adaptation to the new situation are analysed and communicated through the co-located institutions.</p>	<p>Staff are encouraged to provide their own ideas about what should be done to solve any raising problems.</p> <p>Co-location staff are involved in discussing the priorities and consequences of the findings.</p>

Outcome title	<i>Satisfaction during Delivery Service</i>
Type	Performance drivers measure
Definition	This measure indicates levels of satisfaction of the co-located institutions with the construction service provided by the co-location project contractor and sub-contractors.
Purpose of measurement	<ul style="list-style-type: none"> To explore the client's (co-located institutions) perceptions about the construction contractor's services To improve service quality
Weight	27%
Relates to	Transition administration
Method	<ul style="list-style-type: none"> Identify a target for satisfaction level Conduct a survey questionnaire to assess the satisfaction level of the client side (co-location institutions) with the provision of quality contracting services The measured satisfaction level needs to be between 0 and 100. The performance indicator of “Satisfaction of construction/refurbishment service” = $\frac{\text{Current satisfaction level} - \text{Targeted satisfaction level}}{\text{Targeted satisfaction level}}$ This performance feeds into “Transition administration” performance measurement.
Frequency	Quarterly, every six months
Who measures?	Co-location project manager
Source of data	Audits and surveys
Who acts on the data?	Co-location project manager
Notes and comments	<p>The following criteria could be considered when assessing satisfaction levels¹:</p> <ul style="list-style-type: none"> Courtesy = the degree of respect and consideration of the contractor's personnel Consistency = the ability to continually provide the same level of service Convenience = the ease with which the contracting service is obtained Responsiveness = the ability to react to unanticipated problems during the time of the contract

¹ Yasamis, F., Ardittl, D. and Mohammadi, J., (2002), “Assessing contractor quality performance”, *Construction Management and Economic*, 20, 211–223

Performance Results

(Learning built environment)



Outcome title	<i>Space Efficiency</i>
Type	Performance results measure
Definition	This measure indicates the ability of the co-located institutions to use their shared spaces effectively by considering the optimum necessary space for the educational and educational support functions, number of student/staff using the space.
Purpose of measurement	<ul style="list-style-type: none"> To improve space management and planning To encourage cost-effective use of space
Weight	20%
Relates to	Learning built environment
Method	<ul style="list-style-type: none"> Identify target and current values of the following variables: <ul style="list-style-type: none"> Total NIA, total GIA, teaching NIA, research NIA, total office NIA, learning centre NIA, total student FTE, taught student FTE, research student FTE, total staff FTE, research staff FTE, academic staff FTE; Calculate target and current performance of: <ul style="list-style-type: none"> Total NIA per total population (student FTE & staff FTE) Teaching NIA per taught student FTE Research NIA per research student FTE & research staff FTE Total office NIA per staff FTE Learning centre NIA per total student FTE and academic staff FTE Ratio of NIA to GIA For each calculation, divide (current performance – target performance) by target performance Take the average of the results The performance outcome of “Space efficiency” is equal to the result calculated above multiplied by 100 This performance feeds into “Learning built environment” performance measurement.
Frequency	Upon project completion, annually thereafter
Who measures?	Head of Campus Services
Source of data	Institution’s audits, EMS, e-mandate
Who acts on the data?	Director of Estates, Timetabler, Co-location project manager
Notes and comments	<ul style="list-style-type: none"> Differences in teaching NIA need to be recognised when calculating the measures (i.e. teaching areas for design studios and class rooms are different and therefore greater space per student for the first than that for the second) could be noticed.

Outcome title	<i>Space Productivity</i>
Type	Performance results measure
Definition	This measure indicates how effectively the co-located institutions utilise their shared spaces to support educational activities and generate revenue.
Purpose of measurement	<ul style="list-style-type: none"> • To enhance effectiveness of managing and allocating resource • To increase education quality • To support communication among staff and students of the co-located campus • To enhance student and staff productivity • To increase space utilisation
Weight	20%
Relates to	Learning built environment
Method	<ul style="list-style-type: none"> • Identify target and current values of the following variables: <ul style="list-style-type: none"> ○ Total NIA, frequency rate, occupancy rate, research income, teaching income and total income • Calculate target and current performance of: <ul style="list-style-type: none"> ○ Research income per sq m research NIA ○ Teaching income per sq m teaching NIA ○ Total income per sq m NIA ○ Frequency rate ○ Occupancy rate • For each calculation, divide (current performance – target performance) by target performance • Take the average of the results • The performance outcome of “Space productivity” is equal to the result calculated above multiplied by 100 • This performance feeds into “Learning built environment” performance measurement.
Frequency	Upon project completion, annually thereafter
Who measures?	Head of Campus Services
Source of data	Institution’s audits, EMS, e-mandate
Who acts on the data?	Director of Estates, Co-location project manager
Notes and comments	Space frequency rate and occupancy rate could be measured on term (semester) basis.

Outcome title	<i>Cost Effectiveness</i>
Type	Performance results measure
Definition	This measure indicates the extent to which the co-located campus (shared estates) provides educational value for money spent on these shared estates.
Purpose of measurement	<ul style="list-style-type: none"> • To save unnecessary costs • To improve planning and predictions of campus operating costs • To improve allocation of resources
Relates to	Learning built Environment
Target	18%
Method	<ul style="list-style-type: none"> • Identify target and current values of the following variables <ul style="list-style-type: none"> ○ Total property costs, total maintenance costs, total GIA • Calculate target and current performance of: <ul style="list-style-type: none"> ○ Total maintenance costs per sq m GIA ○ Total property costs per sq m GIA ○ Total costs per total per sq m GIA • For each calculation, divide (current performance – target performance) by target performance • Take the average of the results • The performance outcome of “Cost effectiveness” is equal to the result calculated above multiplied by 100 • This performance feeds into “Learning built environment” performance measurement.
Frequency	Upon project completion, annually thereafter
Who measures?	Head of Campus Services
Source of data	Institution’s audits, EMS, e-mandate
Who acts on the data?	Director of Estates, Timetabler, Co-location project manager
Notes and comments	

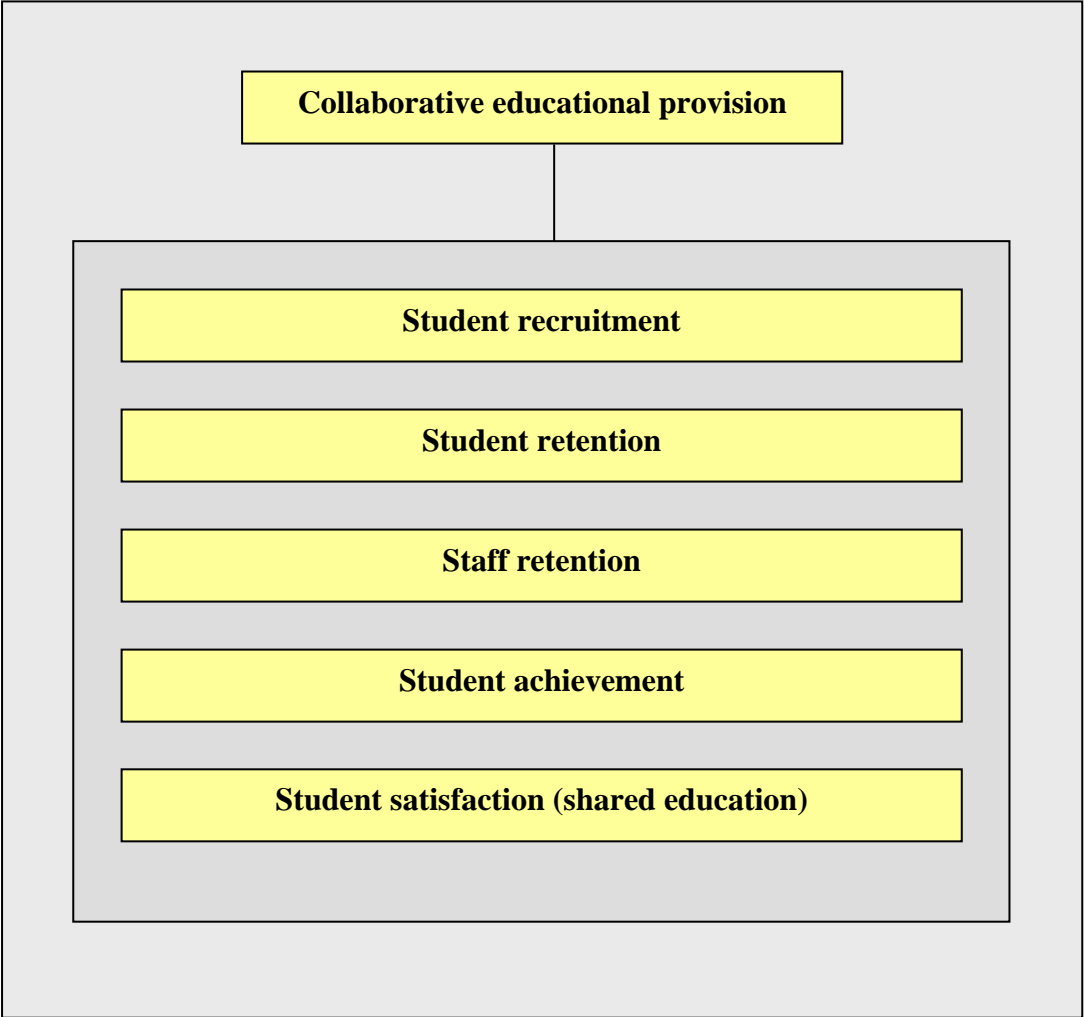
Outcome title	<i>Building Quality</i>
Type	Performance results measure
Definition	This measure indicates measures the level to which the output of the construction project is functional and free of defects and provides safe and healthy studying and working conditions to the co-located institutions' students and staff.
Purpose of measurement	<ul style="list-style-type: none"> • To identify and respond to potential defects • To reduce maintenance costs supporting the learning environment • To enhance student/staff productivity
Weight	17%
Relates to	Learning built environment
Method	<ul style="list-style-type: none"> • Identify targeted satisfaction levels • Conduct a survey questionnaire to assess the satisfaction levels with the quality of the campus buildings • The overall satisfaction level needs to be between 0 and 100 • Divide (current satisfaction levels – target satisfaction levels) by target satisfaction levels • The performance outcome of “Quality of campus building” is equal to the result calculated above multiplied by 100 • This performance feeds into “Learning built environment” performance measurement.
Frequency	Upon project completion, annually thereafter
Who measures?	Co-location project manager, Head of Campus Services
Source of data	Institution's audits, surveys
Who acts on the data?	Director of Estates, Head of Campus Services, Co-location project manager
Notes and comments	<p>The following criteria could be considered when assessing satisfaction levels²:</p> <ul style="list-style-type: none"> • Presentation = Appearance of the building and impression created • Space functionality = Factors that determine operation of spaces • Access and circulation = Access of people and goods, security • Amenity = Facilities for people • Support services = Electrical services and IT • Internal environment = Environmental conditions • Health and safety = Mandatory and other H&S issues • Structural Building = structure and condition • Building management = Ease of campus manageability for the short and long term

² Clift, M. (1996), "Building quality assessment (BQA) for offices", *Structural Survey*, 14 (2), 22–25

Outcome title	<i>Staff/student Satisfaction (Shared space)</i>
Type	Performance results measure
Definition	Student/staff satisfaction measures levels of satisfaction with the integrated use of shared spaces.
Purpose of measurement	<ul style="list-style-type: none"> • To explore student/staff perceptions about spaces used collaboratively between the co-located institutions • To understand their needs and expectations about the optimum characteristics of the shared space provided • To inform the decision-making process regarding space planning and management • To enhance the ability of the co-located institutions to offer well shared space quality
Relates to	Learning built environment
Target	15%
Method	<ul style="list-style-type: none"> • Identify targeted satisfaction levels • Conduct a survey questionnaire to assess the satisfaction level of student/staff of the co-location institutions with the provision of educational support services and facilities • The overall satisfaction level needs to be between 0 and 100 • Divide (.current satisfaction levels – target satisfaction levels) by target satisfaction levels • The performance outcome of “Staff/students satisfaction with shared space” is equal to the result calculated above multiplied by 100 • This performance feeds into “Learning built environment” performance measurement.
Frequency	Shortly after project completion, annually thereafter
Who measures?	Head of Campus Services, Co-location project manager
Source of data	Institution’s audits, EMS, e-mandate
Who acts on the data?	Director of Estates, Co-location project manager
Notes and comments	<p>The following three measurement can be done in one survey at the same frequency:</p> <ul style="list-style-type: none"> • Student/staff satisfaction with the shared services and facilities • Student/staff satisfaction with shared space • Students’ satisfaction with the shared education

Outcome title	<i>Staff/student Satisfaction (Shared facilities and services)</i>
Type	Performance results measure
Definition	Staff/student satisfaction measures levels of satisfaction with the integrated use of shared facilities and services.
Purpose of measurement	<ul style="list-style-type: none"> • To explore staff/ student perceptions about facilities and services used collaboratively between the co-located institutions • To understand student/staff needs and expectations of the service provided • To inform the decision-making process regarding the provision of facilities and services • To enhance the ability of the co-located institutions to offer good quality of shared education support
Weight	10%
Relates to	Learning built environment
Method	<ul style="list-style-type: none"> • Identify targeted satisfaction levels • Conduct a survey questionnaire to assess the satisfaction level of student/staff of the co-location institutions with the provision of shared space • The overall satisfaction level needs to be between 0 and 100 • Divide (current satisfaction levels – target satisfaction levels) by target satisfaction levels • The performance outcome of “Staff/students satisfaction with shared facilities and services” is equal to the result calculated above multiplied by 100 • This performance feeds into “Learning built environment” performance measurement.
Frequency	Shortly after project completion, annually thereafter
Who measures?	Head of Campus Services, Co-location project manager
Source of data	Institution’s audits, EMS, e-mandate
Who acts on the data?	Director of Estates, Co-location project manager
Notes and comments	<p>The following three measurement can be done with one survey at the same frequency:</p> <ul style="list-style-type: none"> • Student/staff satisfaction with the shared services and facilities • Student/staff satisfaction with shared space • Students’ satisfaction with the shared education

(Collaborative educational provision)



Outcome title	<i>Student Recruitment</i>
Type	Performance results measure
Definition	This measure indicates the capability of the co-located institutions to attract students to study at their co-located campus.
Purpose of measurement	<ul style="list-style-type: none"> • To improve admission process • To develop marketing strategies and plans • To improve quality of teaching and research • To maintain reputation for good quality education
Weight	20%
Relates to	Collaborative educational provision
Method	<ul style="list-style-type: none"> • Identify target and current values of the following variables: <ul style="list-style-type: none"> ○ Total number of applications ○ Total number of entrants (new registered students) • Calculate target and current conversion rate by dividing total number of entrants by total number of applications • Divide (current conversion rate - target conversion rate) by target conversion rate • The performance outcome of “Student recruitment” is equal to the result calculated above multiplied by 100 • This performance feeds into “Collaborative educational provision” performance measurement.
Frequency	Annually
Who measures?	Co-location project manager
Source of data	Institutions’ registry documentations and records, HESA
Who acts on the data?	Director of planning, Directors of teaching, learning and research, Co-location project manager
Notes and comments	

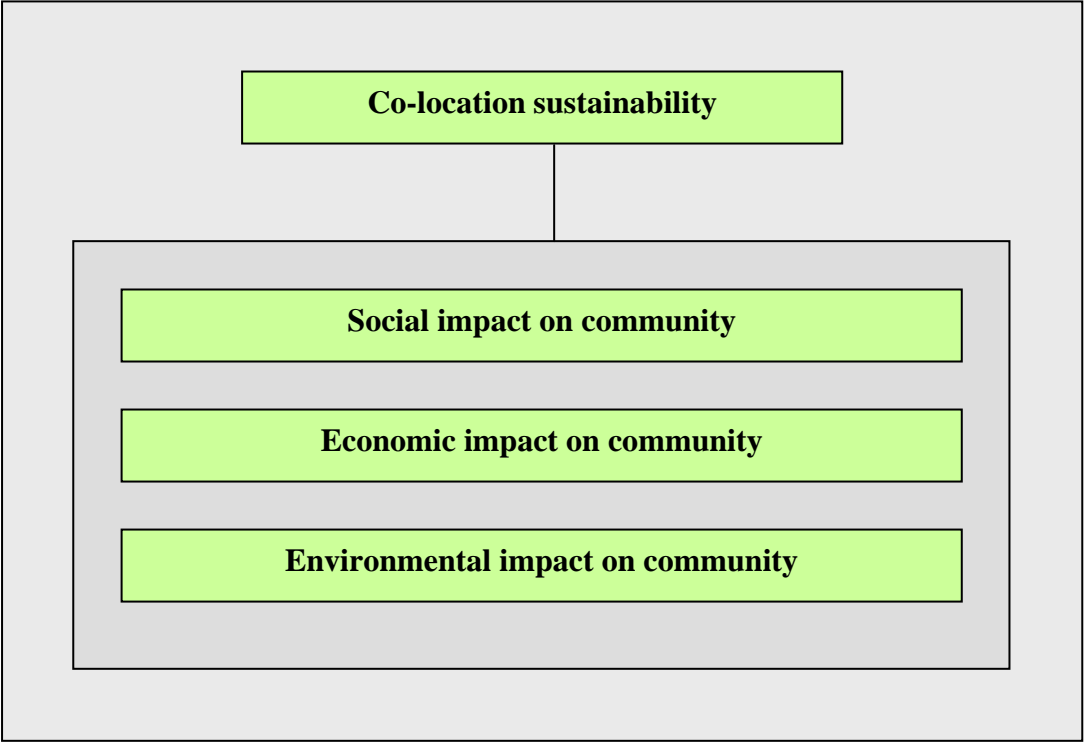
Outcome title	<i>Student Retention</i>
Type	Performance results measure
Definition	This measure indicates the capability of the co-located institutions to maintain and retain students at their co-located campus.
Purpose of measurement	<ul style="list-style-type: none"> • To enhance student experience • To improve quality of teaching and research, articulated courses, programmes and degrees • To maintain reputation for good quality education.
Weight	20%
Relates to	Collaborative educational provision
Method	<ul style="list-style-type: none"> • Identify target and current values of the following variables: <ul style="list-style-type: none"> ○ Total number of enrolled students ○ Number of withdrawn students • Calculate target and current retention rate using this formula: $\text{Retention rate} = \frac{\text{Total student number} - \text{withdrawn number}}{\text{Total student number}}$ • Divide (current retention rate - target retention rate) by target retention rate • The performance outcome of “Student retention” is equal to the result calculated above multiplied by 100 • This performance feeds into “Collaborative educational provision” performance measurement.
Frequency	Annually
Who measures?	Co-location project manager
Source of data	Institutions’ registry documentations and records, HESA
Who acts on the data?	Director of planning, Directors of teaching, learning and research, Co-location project manager
Notes and comments	

Outcome title	<i>Staff Retention</i>
Type	Performance results measure
Definition	This measure indicates the capability of the co-located institutions to maintain and retain high quality staff at their co-located campus.
Purpose of measurement	<ul style="list-style-type: none"> • To enhance training and development opportunities • To improve career development opportunities • To improve the shared working environment
Weight	20%
Relates to	Collaborative educational provision
Method	<ul style="list-style-type: none"> • Identify target and current values of the following variables: <ul style="list-style-type: none"> ○ Total number of staff ○ Number of leaving staff • Calculate target and current retention rate using this formula: $\text{Retention rate} = \frac{\text{Total staff number} - \text{staff leavers}}{\text{Total staff number}}$ • Divide (current retention rate - target retention rate) by target retention rate • The performance outcome of “Staff retention” is equal to the result calculated above multiplied by 100 • This performance feeds into “Collaborative educational provision” performance measurement.
Frequency	Annually
Who measures?	Head of HR
Source of data	HR staffing and recruitment documentation, HESA
Who acts on the data?	HR managers, Co-location project manager
Notes and comments	

Outcome title	<i>Student Achievement</i>
Type	Performance results measure
Definition	This measure indicates the students' progression rate within the co-located institutions.
Purpose of measurement	<ul style="list-style-type: none"> • To improve articulation arrangements • To improve education quality • To improve reputation and image of the shared campus
Weight	20%
Relates to	Collaborative educational provision
Method	<ul style="list-style-type: none"> • Identify target and current values of the following variables: <ul style="list-style-type: none"> ○ Total qualifications obtained ○ Total number of students eligible for graduation ○ Total number of students ○ Number of students who progress from one institution to another within the co-location • Calculate target and current award rate using this formula: $\text{Award rate (AR)} = \frac{\text{Total qualifications obtained}}{\text{Number of students eligible for graduation}}$ • Calculate target and current progression rate using this formula: $\text{Progression rate (PR)} = \frac{\text{Number of progressed students}}{\text{Total number students}}$ • Performance outcome of “Student achievement” = $\frac{\frac{\text{Current (AR)} - \text{Target (AR)}}{\text{Target (AR)}} + \frac{\text{Current (PR)} - \text{Target (PR)}}{\text{Target (PR)}}}{2} \times 100$ • This performance feeds into “Collaborative educational provision” performance measurement.
Frequency	Annually
Who measures?	Co-location project manager
Source of data	Institutions' registry documentations and records, HESA
Who acts on the data?	Director of planning, Directors of teaching, learning and research, Co-location project manager
Notes and comments	

Outcome title	<i>Student Satisfaction (Shared education)</i>
Type	Performance results measure
Definition	This measure indicates levels of satisfaction with the shared teaching and learning activities and articulated programmes.
Purpose of measurement	<ul style="list-style-type: none"> • To explore student perceptions about the quality of the teaching and learning activities that the co-located institutions provide • To inform the decision-making process regarding academic articulation • To enhance the skills of academic staff • To enhance the ability of the co-located institutions to offer good quality education
Weight	20%
Relates to	Collaborative educational provision
Method	<ul style="list-style-type: none"> • Conduct a survey questionnaire to assess the satisfaction level of students of the co-location institutions with the provision of shared education • The overall satisfaction level needs to be between 0 and 100. • Divide (current satisfaction levels – target satisfaction levels) by target satisfaction levels; • The performance outcome of “Staff/student satisfaction with shared education” is equal to the result calculated above multiplied by 100 • This performance feeds into “Collaborative educational provision” performance measurement.
Frequency	Shortly after project completion, annually thereafter
Who measures?	Co-location project manager
Source of data	Institutions’ registry documentations and records, HESA
Who acts on the data?	Director of planning, Directors of teaching, learning and research, Co-location project manager
Notes and comments	

(Co-location sustainability)



Outcome title	<i>Social Impact on Community</i>
Type	Performance results measure
Definition	Social impact on community measures the ability of the co-located institutions to maintain and enhance the existing competences and capabilities of the community.
Purpose of measurement	<ul style="list-style-type: none"> • To develop connections between co-location campus and surrounding community • To maximise positive implications of the co-location campus on the social structure of the community • To improve education in the region • To encourage community participation in the collocation through assessing community needs • To respond to those needs • To respond to key government programmes • To offer lifelong learning opportunities • To use public education facilities as community service centres for meeting the educational, social, and cultural needs
Weight	33%
Relates to	Co-location sustainability
Method	<ul style="list-style-type: none"> • Identify target (x) and current (x1) data of: <ul style="list-style-type: none"> ○ (a, a1) Number of enrolled students coming from the local and surrounding areas ○ (b, b1) Total number of the co-location enrolled students ○ (c, c1) Number of developed courses that address community needs and interests ○ (d, d1) Total number of courses provided by the co-located institutions ○ (e, e1) Number of conferences, seminars, and other learning activities that involve the community ○ (f, f1) Total number of conferences, seminars, and other learning activities delivered by the co-located institutions • Calculate target ratios: $AB = \frac{a}{b}$ $CD = \frac{c}{d}$ $EF = \frac{e}{f}$ • Calculate current ratios: $AB1 = \frac{a1}{b1}$ $CD1 = \frac{c1}{d1}$ $EF1 = \frac{e}{f1}$ • Calculate the performance outcome of “Social impact of the co-location campus on community”:

	$Performance = \frac{\frac{AB1 - AB}{AB} + \frac{CD1 - CD}{CD} + \frac{EF1 - EF}{EF}}{3} \times 100$ <ul style="list-style-type: none"> The result feeds into “Co-location sustainability” performance measurement;
Frequency	Annually
Who measures?	Head of Marketing & Public Relations, Marketing manager, Co-location project manager
Source of data	Institution’s registry records, University/College marketing strategies and plans
Who acts on the data?	Director of corporate communication, Assistant Principal, Co-location project manager
Notes and comments	

Outcome title	<i>Economic Impact on Community</i>
Type	Performance results measure
Definition	Economic impact on community measures the ability of the co-located institutions to contribute to maintaining and enhancing the community’s existing resources and economic health.
Purpose of measurement	<ul style="list-style-type: none"> To develop partnerships between the co-location and public and private service providers, business and industry To increase employment and/or income in the area as a result of co-location campus To enhance programmes designed to respond to business needs and solve pressing problems
Weight	33%
Relates to	Co-location sustainability
Method	<ul style="list-style-type: none"> Identify target (x) and current (x1) data of: <ul style="list-style-type: none"> (a, a1) Number of students who found jobs 6 months after graduation (b, b1) Total number of graduates of the co-location (c, c1) Number of jobs created as a direct impact of the co-location campus (d, d1) Total number of jobs in the area

	<ul style="list-style-type: none"> ○ (e, e1) Number of business collaborations and agreements (consultancy based, training) with the co-located institutions ○ (f, f1) Number of business collaborations and agreements with external organisations <ul style="list-style-type: none"> • Calculate target ratios: $AB = \frac{a}{b}$ $CD = \frac{c}{d}$ $EF = \frac{e}{f}$ • Calculate current ratios: $AB1 = \frac{a1}{b1}$ $CD1 = \frac{c1}{d1}$ $EF1 = \frac{e}{f1}$ • Calculate the performance outcome of “Economic impact of the co-location campus on community”: $Performance = \frac{\frac{AB1 - AB}{AB} + \frac{CD1 - CD}{CD} + \frac{EF1 - EF}{EF}}{3} \times 100$ • The result feeds into “Co-location sustainability” performance measurement.
Frequency	Annually
Who measures?	Finance managers, Head of Marketing & Public Relations, Marketing manager, Co-location project manager
Source of data	Institution’s registry records, university/college marketing strategies and plans
Who acts on the data?	Finance managers, Marketing manager
Notes and comments	Data for “Number of business collaborations and agreements with external organisations” and “Total number of jobs in the area” are obtained from local authority and local business organisations.

Outcome title	<i>Environmental Impact on Community</i>
Type	Performance results measure
Definition	Environmental impact on community measures the effect of the co-located institutions on the surrounding environment and the health and well-being of the community.
Purpose of measurement	<ul style="list-style-type: none"> • To reduce CO2 emission • To promote efficient use of water • To minimise waste • To cut unnecessary costs • To improve planning and control of the resources of the co-located institutions' buildings
Weight	34%
Relates to	Co-location sustainability
Method	<ul style="list-style-type: none"> • Identify target (x) and current (x1) data of: <ul style="list-style-type: none"> ○ (a, a1) Total energy consumption ○ (b, b1) Water/sewerage consumption ○ (c, c1) Waste mass (tonnes) • Identify GIA: • Calculate target performance: $A = \frac{a}{GIA} \quad B = \frac{b}{GIA} \quad C = \frac{c}{GIA}$ • Calculate current performance: $A1 = \frac{a1}{GIA} \quad B1 = \frac{c1}{GIA} \quad C1 = \frac{e}{GIA}$ • Calculate the performance outcome of “Environmental impact of the co-location campus on community”: $Performance = \frac{\frac{A1-A}{A} + \frac{B1-B}{B} + \frac{C1-C}{C}}{3} \times 100$ • The result feeds into “Co-location sustainability” performance measurement;
Frequency	Annually
Who measures?	Head of Campus Services, Co-location project manager
Source of data	Institution's audits, EMS, e-mandate
Who acts on the data?	Director of Estates, Co-location project manager
Notes and comments	